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Group Report

1964-71

Coordinate Conversion for the Haystack Pointing System

P. Stylos

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This report states the mathematics and describes the computer program used to convert inertial coordinates to radar pointing angles, and vice versa, in the Haystack Antenna Pointing System.

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MASSACHUSETTS INSTITUTE OF TECHNOLOGY

LINCOLN LABORATORY

COORDINATE CONVERSION FOR THE HAYSTACK POINTING SYSTEM

P. STYLOS

Group 62

GROUP REPORT 1964-71

10 DECEMBER 1964

LEXINGTON MASSACHUSETTS

ABSTRACT

This report states the mathematics and describes the computer program used to convert inertial celestial coordinates to radar pointing angles, and vice versa, in the Haystack Antenna Pointing System.

Accepted for the Air Force
Stanley J. Wisniewski
Lt Colonel, USAF
Chief, Lincoln Laboratory Office

I. INTRODUCTION

The Haystack antenna pointing system makes use of a coordinate conversion program (COCON). This program accepts celestial inertial coordinates (right ascension, declination, distance, and time) referenced to the equator and equinox of date of a particular point (e.g., star, planet, or artificial earth satellite) and produces the pointing angles and range to that point from the Haystack installation. Range rate is also calculated using the celestial coordinates and their rates.

A second program called RADEC is used in the system for the purpose of deriving right ascension and declination from the range and pointing angles. This program drives the right ascension and declination display lights on the master control console.

II. MATHEMATICAL RELATIONSHIPS

A. Basic Relationships

An ellipsoidal earth is assumed with an equatorial radius of A = 1. (See Fig. 1). The flattening is taken as $f = \frac{1}{297}$. The polar radius is $B = A(1-f)$. Given the geodetic latitude, ϕ_E, of a site, the geocentric latitude δ_E is found.*

$$\tan \delta_E = (1-f)^2 \tan \phi_E \qquad (1)$$

* The following notation is used in this report. A subscript E will denote reference to the earth and a subscript s will denote the object under observation.

The radius of the earth to the site (at 0 height) is

$$R_E = \frac{A \sec \delta_E}{\left[1 + (1-f)^2 \tan^2 \phi_E\right]^{1/2}} \tag{2}$$

The perpendicular distance to the radar plane, located at a height h_E above the surface of the earth, from the geocenter is

$$r_E = h_E + R_E \cos\left(\phi_E - \delta_E\right) \tag{3}$$

The distance d_E to the vertical from the geocenter is

$$d_E = R_E \sin\left(\phi_E - \delta_E\right) \tag{4}$$

B. Inertial Celestial Coordinates to Radar Cartesian Coordinates

Given the celestial inertial coordinates, the geocentric cartesian coordinates of the object are found. The Z axis goes through the North Pole, the X axis through the vernal equinox, and the Y axis makes a right handed orthogonal system.

$$\begin{aligned} X_s &= R_s \cos \delta_s \cos \alpha_s \\ Y_s &= R_s \cos \delta_s \sin \alpha_s \\ Z_s &= R_s \sin \delta_s \end{aligned} \tag{5}$$

where R_s is the distance from the geocenter to the object, δ_s is the declination, and α_s is the right ascension from equinox.

The origin of the radar cartesian coordinate system is the radar site. The Z axis is vertical, the Y axis points north and the X axis points east. The radar cartesian coordinates are found by the matrix relationship

$$\begin{bmatrix} X_r \\ Y_r \\ Z_r \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & \sin \phi_E & \cos \phi_E \\ 0 & -\cos \phi_E & \sin \phi_E \end{bmatrix} \cdot \begin{bmatrix} -\sin \Omega_E & \cos \Omega_E & 0 \\ -\cos \Omega_E & -\sin \Omega_E & 0 \\ 0 & 0 & 1 \end{bmatrix} \cdot \begin{bmatrix} X_s & 0 \\ Y_s + d_E \\ Z_s & -r_E \end{bmatrix} \quad (6)$$

where Ω_E is the local sidereal hour angle of the radar site and is found by

$$\Omega_E = D(ST_1 - ST_o) + ST_o + \lambda_E \quad (7)$$

where D is the fractional part of the observation time expressed in days, ST_1 and ST_o are the apparent sidereal hour angles of Greenwich for the midnights (00 hrs. GMT) succeeding and preceding the time of observation, and λ_E is the longitude of the site (positive east).

The expansion of Eq. (6) leads to the following expressions

$$\begin{aligned} X_r &= R_s \cos \delta_s \sin \left(\alpha_s - \Omega_E\right) \\ Y_r &= R_s\left[\sin \delta_s \cos \phi_E - \sin \phi_E \cos \delta_s \cos \left(\alpha_s - \Omega_E\right)\right] + d_E \\ Z_r &= R_s\left[\cos \delta_s \cos \phi_E \cos \left(\alpha_s - \Omega_E\right) + \sin \delta_s \sin \phi_E\right] - r_e \end{aligned} \quad (8)$$

C. Radar Range From Celestial Coordinates

Taking the square root of the sum of the squares, the range R is found from Eq. (8):

$$R = R_s \left[1 + \frac{2\left(\cos \phi_E d_E - \sin \phi_E r_E\right)\sin \delta_s - 2\left(\sin \phi_E d_E + \cos \phi_E r_E\right)\cos \delta_s \cos\left(\alpha_s - \Omega_E\right)}{R_s} + \frac{r_E^2 + d_E^2}{R_s^2} \right]^{1/2} \tag{9}$$

Although Eq. (9) appears somewhat cumbersome, the values in the parenthesis involving ϕ_E, d_E, and r_E are stored as constants. Note that in the case of distant stars $R_s \to \infty$ and hence $R \to R_s$.

D. Azimuth From Celestial Coordinates

In order to find azimuth, first an angle AZI is found using Eq. (8)

$$AZI = \tan^{-1}\left|\frac{X_r}{Y_r}\right|$$

$$= \tan^{-1}\left| \frac{\cos \delta_s \sin\left(\alpha_s - \Omega_E\right)}{\sin \delta_s \cos \phi_E - \cos \delta_s \sin \phi_E \cos\left(\alpha_s - \Omega_E\right) + \frac{d_E}{R_s}} \right| \tag{10}$$

The azimuth (A), which is measured from north, is then determined using the following rules:

if X_r and Y_r are both positive, A lies in the first quadrant and A = AZI

if X_r is positive and Y_r is negative, A lies in the fourth quadrant and A = 180° −AZI

if X_r and Y_r are both negative, A lies in the third quadrant and A = 180° + AZI

if X_r is negative and Y_r is positive, A lies in the second quadrant and A = 360° −AZI

If $\alpha_s = \Omega_E$, the numerator of (10) goes to zero giving rise to the following special cases:

when $\delta_s > \phi_E$, A = 0°

$\delta_s < \phi_E$, A = 180°

$\delta_s = \phi_E$, object directly overhead.

An examination of the denominator of (10) leads to the following special cases:

as $\delta_s \to 90^\circ$, the denominator $\to \infty$ and the arc tan of AZI $\to 0$.

The conclusion is that

if $\delta_s = 90^\circ$, A = 0°,

if $\delta_s = -90^\circ$, A = 180°.

If the denominator = 0, then for

$\alpha_s > \Omega_E$, $A = 90^\circ$,

$\alpha_s < \Omega_E$, $A = 270^\circ$,

$\alpha_s = \Omega_E$, the point is directly overhead and A is arbitrarily set to 0°.

E. Elevation From Celestial Coordinates

The elevation (E) is found using the results of Eqs. (8) and (9) in

$$E = \sin^{-1} \frac{Z_R}{R} \tag{11}$$

As the numerator goes to zero the elevation angle goes to zero. If the numerator is negative the object is below the radar horizon.

F. Range Rate From Celestial Coordinates

The expression for computing range rate is found simply by differentiating Eq. (9).

$$\dot{R} = \frac{R_s}{2R} \left[\left\{ 2 + \frac{K_1 \sin \delta_s}{R_s} - \frac{K_2 \cos \delta_s \cos (\alpha_s - \Omega_E)}{R_s} \right\} \dot{R}_s + \left\{ K_1 \cos \delta_s \right.\right.$$

$$\left.\left. + K_2 \sin \delta_s \cos (\alpha_s - \Omega_E) \right\} \dot{\delta}_s + K_2 \cos \delta_s \sin (\alpha_s - \Omega_E) (\dot{\alpha}_s - \dot{\Omega}_E) \right] \tag{12}$$

where K_1 and K_2 are constants (defined in Section III Bla). The derivatives of the celestial coordinates are provided as input to the coordinate conversion program while the derivative of the local sidereal hour angle of the site is derived from the apparent sidereal hour angles.

G. Right Ascension and Declination From Radar Coordinates

Solving (6) for the geocentric cartesian coordinates

$$\begin{bmatrix} X_s \\ Y_s \\ Z_s \end{bmatrix} = \begin{bmatrix} -\sin\Omega_E & -\sin\phi_E\cos\Omega_E & \cos\phi_E\cos\Omega_E \\ \cos\Omega_E & -\sin\phi_E\sin\Omega_E & \cos\phi_E\sin\Omega_E \\ 0 & \cos\phi_E & \sin\phi_E \end{bmatrix} \cdot \begin{bmatrix} X_r \\ Y_r - d_E \\ Z_r - r_E \end{bmatrix} \qquad (13)$$

In this case X_r, Y_r, and Z_r are found from the radar pointing angles

$$\begin{aligned} X_r &= R\cos E\sin A \\ Y_r &= R\cos E\cos A \\ Z_r &= R\sin E \end{aligned} \qquad (14)$$

where R is radar range, E is elevation, and A is azimuth.

Expanding Eq. (13) and using the relationships in (14) the celestial cartesian coordinates are found:

$$X_s = R\left[\cos\Omega_E\left\{\sin E\cos\phi_E - \cos E\cos A\sin\phi_E + \frac{d_E\sin\phi_E + r_E\cos\phi_E}{R}\right\} - \cos E\sin A\sin\Omega_E\right] \equiv RX'_s$$

$$Y_s = R\left[\sin\Omega_E\left\{\sin E\cos\phi_E - \cos E\cos A\sin\phi_E + \frac{d_E\sin\phi_E + r_E\cos\phi_E}{R}\right\} + \cos E\sin A\cos\Omega_E\right] \equiv RY'_s$$

$$Z_s = R\left[\cos E\cos A\cos\phi_E + \sin E\sin\phi_E - \frac{d_E\cos\phi_E - r_E\sin\phi_E}{R}\right] \equiv RZ'_s \qquad (15)$$

Right Ascension is found by

$$\alpha_s = \tan^{-1} \frac{X'_s}{Y'_s} \tag{16}$$

and Declination by

$$\delta_s = \tan^{-1} \frac{Z'_s}{\left[\left(X'_s\right)^2 + \left(Y'_s\right)^2\right]^{1/2}} \tag{17}$$

In the event $R \to \infty$, Eqs. (16) and (17) still hold since

$$\lim_{R \to \infty} \frac{R}{\overline{R}} = 1$$

III. THE COORDINATE CONVERSION PROGRAM (COCON)

A. COCON Inputs

There are four types of inputs to COCON

1. Common Storage Parameters

Site parameters and physical constants are found in common storage. The following quantities are used:

Site geodetic latitude in degrees with B20*

Site longitude in degrees with B20

Site height in feet with B0

Equatorial Earth Radius in nautical miles with B17

*Conventionally a B of 20, or B20, means the binary point is to the right of bit 20.

2. Greenwich Sidereal Time

The first file of the ephemeris tape* contains the apparent sidereal time of Greenwich. This file is comprised of two records. The first file gives the day number of the first entry of the second file, the epoch date being January 1.0, 1964. The second record contains one word for each day corresponding to 00 hours GMT. This word gives the apparent sidereal time of Greenwich in radians with a B of 26.

3. Console Writer

If the sidereal times for the required days are not found on the ephemeris tape, or if a tape error is encountered, the experimenter is given the option of having the program try to read the tape again or of having it compute** the sidereal time.

4. Inertial Celestial Coordinates and Rates

The arguments are:

SRA	Right ascension in revolutions B27
SDEC	Declination in revolutions B27
RADIUS	Distance - if in earth radii the distance is stored with B22 - if in astronomical units the distance is complemented and stored with B24 - if ∞, a zero is stored

*See Group Report 1964-41, "Haystack Pointing System: Ephemeris Tape Program", D. M. Hafford, 25 September 1964

**For the year 1964, the sidereal time of Greenwich in radians for the i^{th} day is given by $ST_i = i(.01720279) + 1.7193827$.

RADOT	Time rate of change of right ascension in radians/sec B37
DECDOT	Time rate of change of declination in radians/sec B37
RADIOSDOT	Time rate of change of radius in nautical miles/sec B24
CONVERTIME	GMT of observation in days B28

B. COCON Program Details

1. Initialization

The initialization section performs the following functions:

a. Computes r_E and d_E from Eqs. (3) and (4)

Computes:

$$K_1 = 2\left(\cos \phi_E d_E - \sin \phi_E r_E\right)$$

$$K_2 = 2\left(\sin \phi_E d_E - \cos \phi_E r_E\right)$$

$$K_3 = \left(r_E^2 + d_E^2\right)$$

$$\dot{\Omega}_E = \left(ST_{i+1} - ST_i\right)/86400$$

KIDOP = K_1 in nautical miles for range rate computation

K2DOP = K_2 in n m

b. Read from the ephemeris tape or compute

ST_i, ST_{i+1}, ST_{i+2} where i is the day of the experiment (January 1.0 = 1)

c. Set local sidereal hour angle using CONVERTIME.

2. Working Section

The working section of COCON is a straight forward computation program using Eqs. (9), (10), (11) and (12) to find range, azimuth, elevation and range rate.

C. COCON Outputs

COCON outputs left in common storage are:

GEOCENLAT	geocentric latitude in degrees B20
SIDERTIME	local sidereal hour angle in radians B26
YRTRAN	d_E from Eq. (4)
ZRTRAN	r_E from Eq. (3)
AZIM	azimuth in revolutions B27
ELEV	elevation in revolutions B27
RANGE	in radar units with B0
TRUERANGE	+ = ER radii B22
	− = complement in A. U. B24
	0 = STAR (arbitrarily infinite)

IV. THE RADEC PROGRAM

A. RADEC Inputs

1. Common Storage

RADEC makes use of the site parameters and some constants computed by COCON. These are:

YRTRAN, ZRTRAN, ϕ_E, λ_E, FRAMESIZE

2. Typewriter

The experimenter has the option of selecting a set of coordinates from which right ascension and declination are derived. There are two distinct classes of coordinates available as input to RADEC:

a. Celestial as found in common storage

. RA and DEC in revolutions B27

. RA and DEC both with scan in revolutions B27

b. Azimuth and elevation

. Actual	the actual azimuth and elevation of the antenna - an infinite range is used.
. Command	the azimuth and elevation commands being sent to the antenna - infinite range.
. Uncorrected AZ-EL	azimuth, elevation, and true range as output from COCON.
. AZ-EL+SCAN	azimuth and elevation as modified by the scan program, and true range.
. Corrected AZ - EL	azimuth and elevation with scan as corrected for site characteristics, and true range.

B. RADEC Program Details

1. Initialization

The initialization section of this program computes two constants, sets the time delay, and sets the switch for selecting the required input coordinates.

The computed constants are K_1 and K_2 and are used in Eq. (15)

$$K_1 = d_E \sin \phi_E + r_E \cos \phi_E$$

$$K_2 = d_E \cos \phi_E - r_E \sin \phi_E$$

Since pointing angles are computed ahead of real time to allow for interpolation, the local sidereal hour angle as stored by COCON does not correspond to the time for the actual radar coordinates. In order to compensate for this fact, the amount of earth's rotation in 2 framesizes is subtracted from SIDERTIME.

The selection of input coordinates to RADEC is at the discretion of the experimenter. When the pointing system is cranked up, RADEC selects actual radar coordinates. The experimenter may, via the typewriter, modify RADEC to select any one of the above mentioned 7 inputs.

2. Working Section

The working section of RADEC operates once every second or once a frame. If the system is cycling normally (a frame every two seconds), RADEC's working section operates every second. The first entry is from the Master Control Program, while the second entry is effected via the one second interrupt. If the system is cycling in a high speed planning mode (no computer time buffering between frames), the interrupt portion of RADEC is disabled.

The rest of the working section is a straight forward computation routine. If the inputs are radar coordinates, the expressions found in II G are used to generate right ascension and declination. If the inputs are in celestial coordinates, coordinate conversion is not required.

C. RADEC Outputs

There are two RADEC outputs. The first output uses channel 5* to drive the display lights. This is accomplished by an external-function command. Figure 2 shows the format of the words going out on channel 5. The right ascension is displayed in time (hours, minutes, seconds) whereas the declination is in degrees (degrees, minutes, seconds). The local hour angle is sub channel 6 and has the same format as the right ascension. (The local hour angle is, SIDERTIME - right ascension.)

The second output stores right ascension and declination in ASTRORA and ASTRODEC for use by the radiometer program. These registers are the images of the words going out on channel 5.

*J. E. Gillis, A. F. Dockrey and S. B. Russell, to be published.

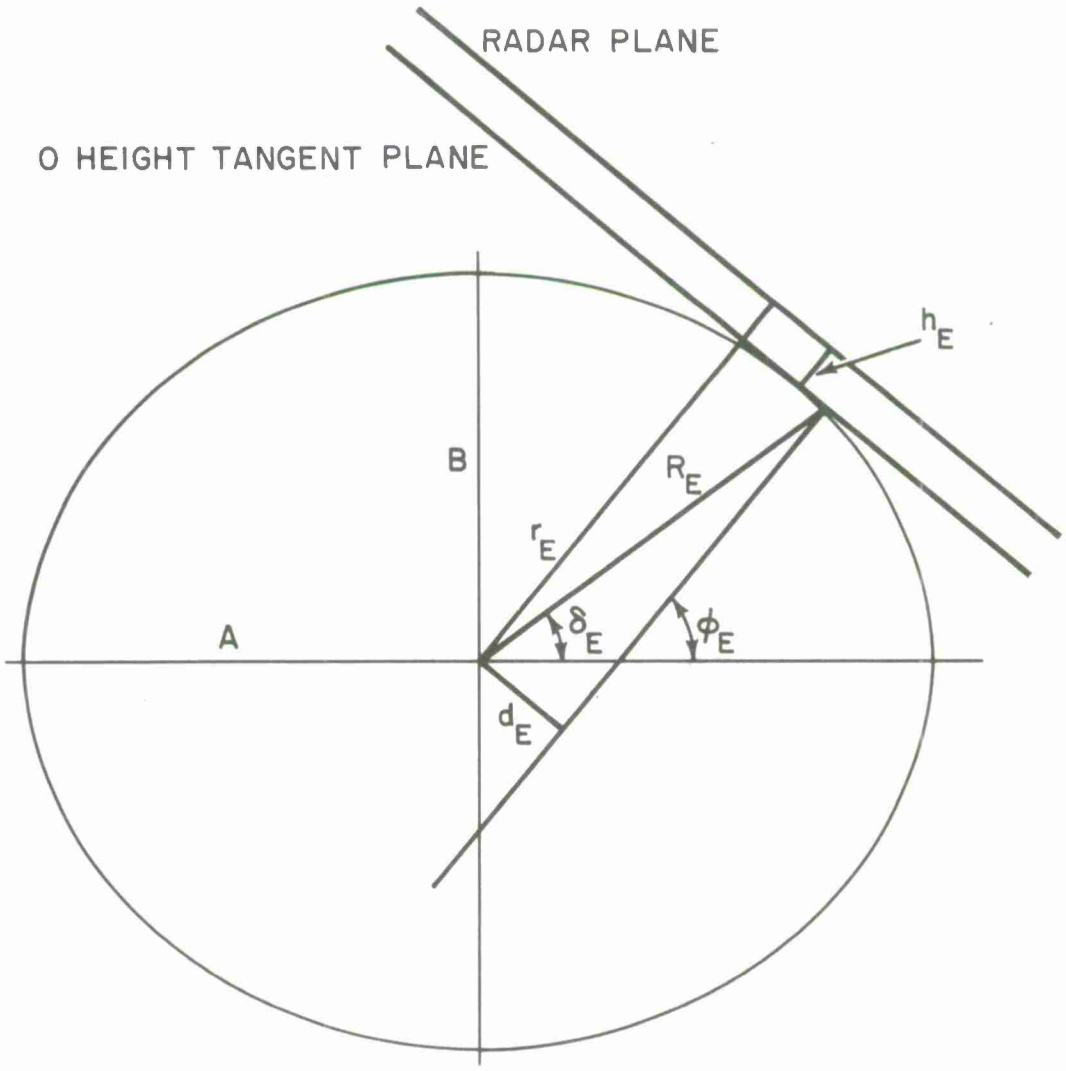

Fig. 1. Ellipsoidal Earth

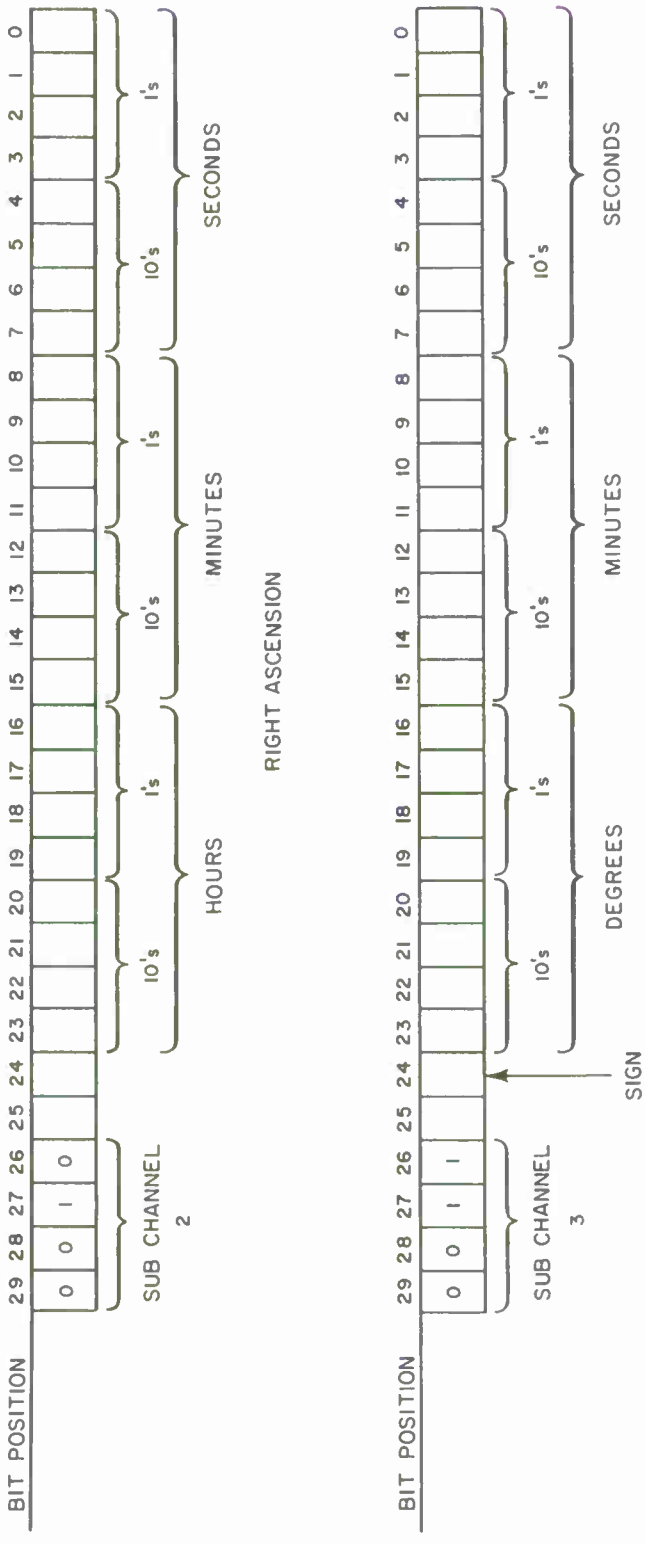

Fig. 2. Output Format for Right Ascension and Declination

```
CAROS    LI (O LABEL      TA STATEMENT                          LOC    F JKB Y      NOTES

   .     00000 COCON         PROGRAM   STYLOS*9/16/64
   .     00001 COCONX        U-TAG     REGULAR*(NIT            00000  00465 00002
   .     00002               FO   1*COCON                      00001  10241 02423
   .     00003 (NIT          ENTRY                             00002  61000 00000  ENTRY TO (NITIALIZATION
   .     00004               ENT  Q*W(GEOOETLAT)               00003  10030 63321  B20 IN OEGREES
   .     00005               MUL  W(OEGRAO)                    00004  22030 01254  PROOUCT HAS 849
   .     00006               LSH  AQ*7                         00005  07000 00007  B56
   .     00007               STR  A*W(PHEE)                    00006  15030 01251  GEOOETIC LATITUOE IN RAOIANS B
                                                                                     26
   .     00010               ENT  Q*W(TR(GSCALF)               00007  10030 01176
   .     00011               RJP  SIN                          00010  65000 01453
   .     00012               STR  A*W(S(NPHEE)                 00011  15030 01232  B28
   .     U0013               ENT  Q*W(TR(GSCALF)               00012  10030 01176
   .     00014               ENT  A*W(PHEE)                    00013  11030 01251
   .     00015               RJP  COS                          00014  65000 01442
   .     00016               STR  A*W(COSPHEE)                 00015  15030 01231  B28
   .     00017               CL   Q*                           00016  10000 00000
   .     00020               ENT  A*W(S(NPHEE)                 00017  11030 01232
   .     00021               RSH  AQ*3                         00020  03000 00003  B55
   .     00022               OIV  W(COSPHEE)                   00021  23030 01231
   .     00023               STR  Q*W(TANPHEE)                 00022  14030 01255  B27
   .     00024               ENT  Q*W(LONGITUOE)               00023  10030 63320
   .     00025               MUL  W(OEGRAO)                    00024  22030 01254
   .     00026               LSH  AQ*7                         00025  07000 00007
   .     00027               STR  A*W(SITELONG)                00026  15030 01163
   .     U0030               ENT  A*W(PHEE)                    00027  11030 01251
   .     00031               LSH  A*1                          00030  06000 00001
   .     00032               ENT  Q*W(TR(GSCALF)               00031  10030 01176
   .     00033               STR  A*W(TWICEPHEE)               00032  15030 01434
   .     00034               RJP  SIN                          00033  65000 01453
   .     00035               LSH  AQ*300                       00034  07000 00036
   .     00036               MUL  W(K2PHEE)                    00035  22030 01436  PROOUCT IN RAOIANS B56
   .     00037               STR  A*W(TEMP)                    00036  15030 01221
   .     00040               ENT  A*W(TW(CEPHEE)               00037  11030 01434
   .     00041               SUB  A*W(THSIXTY)                 00040  21030 01162
   .     U0042               AOO  A*W(TW(OEPHEE)*APOS          00041  20630 01434
   .     00043               AOO  A*W(THSIXTY)                 00042  20030 01162
   .     00044               STR  A*W(FOURPHEE)                00043  15030 01435
   .     00045               ENT  Q*W(TR(GSCALF)               00044  10030 01176
   .     00046               RJP  SIN                          00045  65000 01453
   .     00047               LSH  AQ*300                       00046  07000 00036  SIN 4PHEE B28
   .     00050               MUL  W(K4PHEE)                    00047  22030 01437  PROOUCT IN RAOIANS B56
   .     00051               STR  A*W(TEMPA)                   00050  15030 01233
   .     00052               ENT  A*W(FOURPHEE)                00051  11030 01435
   .     00053               SUB  A*W(THSIXTY)                 00052  21030 01162
   .     00054               AOO  A*W(TW(CEPHEE)*APOS          00053  20630 01434
   .     00055               AOO  A*W(THSIXTY)                 00054  20030 01162
   .     00056               ENT  Q*W(TRIGSCALF)               00055  10030 01176
   .     00057               RJP  SIN                          00056  65000 01453
   .     00060               LSH  AQ*300                       00057  07000 00036
   .     00061               MUL  W(K6PHEE)                    00060  22030 01440  PROOUCT IN RAOIANS B56
   .     00062               AOO  A*W(TEMP)                    00061  20030 01221
   .     00063               STR  A*W(TEMP)                    00062  15030 01221
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CAROS	L1 IO LABEL	TA STATEMENT	LOC	F JKB Y	NOTES
.	00064	ENT A*W(PHEE)	00063	11030 01251	
.	00065	ADD A*W(TEMPA)	00064	20030 01233	
.	00066	SUB A*W(TEMP)	00065	21030 01221	
.	00067	STR A*W(DELLAT)	00066	15030 01257	B26 IN RADIANS
.	00070	LSH AQ*30D	00067	07000 00036	
.	00071	MUL W(RADTODEG)	00070	22030 01441	B49 IN DEGREES
.	00072	LSH AQ*1	00071	07000 00001	
.	00073	STR A*W(GEOCENLAT)	00072	15030 63322	
.	00074	ENT A*W(DELLAT)	00073	11030 01257	
.	00075	ENT Q*W(TRIGSCALF)	00074	10030 01176	
.	00076	RJP COS	00075	65000 01442	
.	00077	STR A*W(COSDELLAT)	00076	15030 01271	
.	00100	ENT Q*W(TANPHEE)	00077	10030 01255	
.	00101	MUL W(TANPHEE)	00100	22030 01255	
.	00102	LSH AQ*31D	00101	07000 00037	B25
.	00103	MUL W(FLATSQ)	00102	22030 01260	B54
.	00104	ADD A*W(UNINBIT24)	00103	20030 01261	
.	00105	RJP SQRT	00104	65000 01561	SQUARE ROOT HAS B26
.	00106	JP $	00105	61000 00105	
.	00107	LSH AQ*30D	00106	07000 00036	
.	00110	MUL W(COSDELLAT)	00107	22030 01271	B54
.	00111	LSH AQ*3	00110	07000 00003	
.	00112	STR A*W(TEMP)	00111	15030 01221	B27
.	00113	CL Q*	00112	10000 00000	
.	00114	ENT A*W(AA)	00113	11030 01256	B25
.	00115	DIV W(TEMP)	00114	23030 01221	QUOTIENT HAS B28
.	00116	STR Q*W(CAPRE)	00115	14030 01262	CAPITAL RE B28
.	00117	ENT Q*W(HEIGHT)	00116	10030 63326	EARTH RADII
.	00120	MUL W(FTTOER)	00117	22030 01263	
.	00121	RSH AQ*1	00120	03000 00001	
.	00122	STR Q*W(TEMP)	00121	14030 01221	MUST HAVE B29
.	00123	ENT A*W(PHEE)	00122	11030 01251	
.	00124	SUB A*W(DELLAT)	00123	21030 01257	
.	00125	STR A*W(PHEEMDEL)	00124	15030 01266	
.	00126	ENT Q*W(TRIGSCALF)	00125	10030 01176	
.	00127	RJP SIN	00126	65000 01453	
.	00130	STR A*W(SINPHEMDEL)	00127	15030 01267	
.	00131	ENT A*W(PHEEMDEL)	00130	11030 01266	
.	00132	ENT Q*W(TRIGSCALF)	00131	10030 01176	
.	00133	RJP COS	00132	65000 01442	
.	00134	STR A*W(COSPHEMDEL)	00133	15030 01270	
.	00135	ENT Q*W(CAPRE)	00134	10030 01262	B28
.	00136	MUL W(COSPHEMDEL)	00135	22030 01270	B56
.	00137	LSH AQ*3	00136	07000 00003	B59
.	00140	ADD A*W(TEMP)	00137	20030 01221	
.	00141	STR A*W(RE)	00140	15030 01224	B29 RE
.	00142	STR A*W(ZRTRAN)	00141	15030 63330	
.	00143	ENT Q*W(CAPRE)	00142	10030 01262	B28
.	00144	MUL W(SINPHEMDEL)	00143	22030 01267	B56
.	00145	LSH AQ*4	00144	07000 00004	B60
.	00146	STR A*W(DE)	00145	15030 01223	B30 DE
.	00147	STR A*W(YRTRAN)	00146	15030 63327	
.	00150	ENT Q*W(SINPHEE)	00147	10030 01232	B28

CAROS	L1 IO LABEL	TA STATEMENT	LOC	F JKB Y	NOTES
.	00151	MUL W(RE)	00150	22030 01224	B27
.	00152	STR A*W(TEMP)	00151	15030 01221	B28
.	00153	ENT Q*W(COSPHEE)	00152	10030 01231	
.	00154	MUL W(OE)	00153	22030 01223	B58
.	00155	RSH AQ*1	00154	03000 00001	
.	00156	SUB A*W(TEMP)	00155	21030 01221	
.	00157	LSH AQ*2	00156	07000 00002	MULTIPLY BY 2 ANS HAS B28
.	00160	STR A*W(K1)	00157	15030 01227	
.	00161	ENT Q*W(COSPHEE)	00160	10030 01231	
.	00162	MUL W(RE)	00161	22030 01224	B57
.	00163	STR A*W(TEMP)	00162	15030 01221	
.	00164	ENT Q*W(SINPHEE)	00163	10030 01232	
.	00165	MUL W(DE)	00164	22030 01223	B58
.	00166	RSH AQ*1	00165	03000 00001	
.	00167	ADD A*W(TEMP)	00166	20030 01221	
.	00170	LSH AQ*2	00167	07000 00002	
.	00171	STR A*W(K2)	00170	15030 01226	K2828
.	00172	ENT Q*W(K1)	00171	10030 01227	
.	00173	MUL W(EQUATOR)	00172	22030 63323	
.	00174	LSH AQ*1	00173	07000 00001	
.	00175	STR A*W(K100P)	00174	15030 01215	
.	00176	ENT Q*W(K2)	00175	10030 01226	
.	00177	MUL W(EQUATOR)	00176	22030 63323	
.	00200	LSH AQ*1	00177	07000 00001	
.	00201	STR A*W(K200P)	00200	15030 01216	
.	00202	ENT Q*W(RE)	00201	10030 01224	
.	00203	MUL W(RE)	00202	22030 01224	
.	00204	LSH AQ*1	00203	07000 00001	B59
.	00205	STR A*W(TEMP)	00204	15030 01221	
.	00206	ENT Q*W(OE)	00205	10030 01223	
.	00207	MUL W(OE)	00206	22030 01223	
.	00210	RSH AQ*1	00207	03000 00001	
.	00211	ADD A*W(TEMP)	00210	20030 01221	
.	00212	STR A*W(K3)	00211	15030 01225	B29 K3
.	00213	ENT A*W(SYSTAT2)*APOS	00212	11630 63314	
.	00214	JP $+4	00213	61000 00217	
.	00215	ENT A*W(RACONEARAD)	00214	11030 01235	SET CONSTANT FOR EARTH RADII
.	00216	STR A*W(RANGECON)	00215	15030 01234	
.	00217	JP ENDINIT	00216	61000 00244	
.	00220	ENT A*W(RACONAU)	00217	11030 01236	
.	00221	STR A*W(RANGECON)	00220	15030 01234	SET CONSTANT FOR A.U.
.	00222	ENT Q*W(K1)	00221	10030 01227	
.	00223	MUL W(ERTOAU)	00222	22030 01264	
.	00224	STR A*W(K1)	00223	15030 01227	
.	00225	ENT Q*W(K2)	00224	10030 01226	
.	00226	MUL W(ERTOAU)	00225	22030 01264	
.	00227	STR A*W(K2)	00226	15030 01226	
.	00230	ENT Q*W(K3)	00227	10030 01225	
.	00231	MUL W(ERTOAU)	00230	22030 01264	
.	00232	LSH AQ*300	00231	07000 00036	
.	00233	MUL W(ERTOAU)	00232	22030 01264	
.	00234	STR A*W(K3)	00233	15030 01225	
.	00235	ENT Q*W(RE)	00234	10030 01224	

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CAROS    L1 IO LABEL      TA STATEMENT                                LOC    F JKB Y      NOTES

   .     00236                  MUL   W(ERTOAU)                      00235  22030 01264
   .     00237                  STR   A*W(RE)                        00236  15030 01224
   .     00240                  STR   A*W(ZRTRAN)                    00237  15030 63330
   .     00241                  ENT   Q*W(OE)                        00240  10030 01223
   .     00242                  MUL   W(ERTOAU)                      00241  22030 01264
   .     00243                  STR   A*W(OE)                        00242  15030 01223
   .     00244                  STR   A*W(YRTRAN)                    00243  15030 63327
   .     00245 ENOINIT          NO-OP                                00244  12000 00000
   .     00246 REAOSTC          ENT   A*W(35)                        00245  11030 00035
   .     00247                  STR   A*W(SAVE35)                    00246  15030 01272
   .     00250                  JP    REWAOK                         00247  61000 00265
   .     00251 REAOSTC1         ENT   A*W(REWANS)                    00250  11030 01273
   .     00252                  STR   A*W(35)                        00251  15030 00035
   .     00253                  EX-FCT     C15*3010000002            00252  13670 01770
   .     00254                  NO-OP                                00253  12000 00000
   .     00255                  JP    $                              00254  61000 00254
   .     00256 REWANS1          STR   C15*W(TEMP)                    00255  17670 01221
   .     00257                  RIL                                  00256  60000 00000
   .     00260                  ENT   A*U(TEMP)                      00257  11020 01221
   .     00261                  RSH   A*110                          00260  02000 00013
   .     00262                  SUB   A*5*ANOT                       00261  21500 00005
   .     00263                  JP    REWAOK                         00262  61000 00265
   .     00264                  SUB   A*3*AZERO                      00263  21400 00003
   .     00265                  JP    REWERROR                       00264  61000 00307
   .     00266 REWAOK           ENT   A*W(READFR)                    00265  11030 01274  REWIND OK
   .     00267                  STR   A*W(35)                        00266  15030 00035
   .     00270                  IN    C15*W(FREC)                    00267  73670 01275
   .     00271                  NO-OP                                00270  12000 00000
   .     00272                  EX-FCT     C15*5200000002            00271  13670 01771
   .     00273                  JP    $                              00272  61000 00272
   .     00274 FRREAD           STR   C15*W(TEMP)                    00273  17670 01221  FIRST RECORD READ
   .     00275                  RJP   STATCK                         00274  65000 00335
   .     00276                  ENT   A*W(TAPESTAT)                  00275  11030 01311
   .     00277                  SUB   A*5*ANOT                       00276  21500 00005
   .     00300                  JP    REWAOK                         00277  61000 00265  TRY AGAIN UNIT REWINDING
   .     00301                  SUB   A*3*ANOT                       00300  21500 00003
   .     00302                  JP    PROCFREC                       00301  61000 00342
   .     00303                  ENT   A*W(FRINDIC)*AZERO             00302  11430 01422
   .     00304                  JP    TAPEBUST                       00303  61000 00353
   .     00305                  AOO   A*W(WNEREV)                    00304  20030 01202
   .     00306                  STR   A*W(FRINDIC)                   00305  15030 01422
   .     00307                  JP    REAOSTC1                       00306  61000 00250  TRY ONE MORE TIME
   .     00310 REWERROR         RJP   U(INTERCOM)                    00307  65020 63426  REWIND ERROR
   .     00311                  U-TAG      REMESS*INREMESS           00310  01323 01360
   .     00312                  ENT   A*W(INTERREW)*ANOT             00311  11530 01364
   .     00313                  JP    REAOSTC1                       00312  61000 00250
   .     00314 COMPST           ENT   Q*W(STCONST)                   00313  10030 00333
   .     00315                  MUL   L(DAY)                         00314  22010 63150
   .     00316                  SUB   Q*W(THSIXTY)*QNEG              00315  27730 01162
   .     00317                  JP    $-1                            00316  61000 00315
   .     00320                  AOO   Q*W(GREPOCH)*QPOS              00317  26630 00334
   .     00321                  AOO   Q*W(THSIXTY)                   00320  26030 01162
   .     00322                  STR   Q*W(FRBEG)                     00321  14030 01276
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CAROS    L1 IO LABEL      TA STATEMENT                          LOC    F JKB Y      NOTES
   .     00323             SUB  Q*W(THS1XTY)                   00322  27030 01162
   .     00324             AOO  Q*W(STCONST)*QPOS              00323  26630 00333
   .     00325             AOO  Q*W(THSIXTY)                   00324  26030 01162
   .     00326             STR  Q*W(FRBEG+1)                   00325  14030 01277
   .     00327             SUB  Q*W(THSIXTY)                   00326  27030 01162
   .     00330             AOO  Q*W(STCONST)*QPOS              00327  26630 00333
   .     00331             AOO  Q*W(THSIXTY)                   00330  26030 01162
   .     00332             STR  Q*W(FRBEG+2)                   00331  14030 01300
   .     00333             JP   CONTAOK                        00332  61000 00436
   .     00334 STCONST     0004316633                          00333  C0043 16633  OEC        .01720279826
   .     00335 GREPOCH     0670122733                          00334  06701 22733  OEC        1.7193827826      TO
                                                                                    BE CHANGED EACH YEA
   .     00336 STATCK      JP   STATCK                         00335  61000 00335  SET TAPESTATUS
   .     00337             ENT  A*U(TEMP)                      00336  11020 01221
   .     00340             RSH  A*110                          00337  02000 00013
   .     00341             STR  A*W(TAPESTAT)                  00340  15030 01311
   .     00342             RILJP     L(STATCK)                 00341  60110 00335
   .     00343 PROCFREC    ENT  A*U(FRBEG)*ANOT                00342  11520 01276  PROCESS FIRST RECORD
   .     00344             JP   CONTFR                         00343  61000 00373  PROPER IO
   .     00345             ENT  A*W(FRINOIC)*ANOT              00344  11530 01422
   .     00346             JP   REWERROR-3                     00345  61000 00304
   .     00347             RJP  U(INTERCOM)                    00346  65020 63426
   .     00350             U-TAG     FRMESS*INFRMESS           00347  01341 01365
   .     00351             ENT  A*W(INTERFR)*ANOT              00350  11530 01371
   .     00352             JP   READSTC1                       00351  61000 00250
   .     00353             JP   COMPST                         00352  61000 00313
   .     00354 TAPEBUST    ENT  A*W(TAPESTAT)                  00353  11030 01311
   .     00355             CL   Q                              00354  10000 00000
   .     00356             RSH  AQ*1                           00355  03000 00001
   .     00357             AOO  A*480                          00356  20000 00060
   .     00360             LSH  A*3                            00357  06000 00003
   .     00361             LSH  AQ*3                           00360  07000 00003
   .     00362             AOO  A*480                          00361  20000 00060
   .     00363             STR  A*W(WRITSTAT)                  00362  15030 01400
   .     00364             RJP  U(INTERCOM)                    00363  65020 63426
   .     00365             U-TAG     BUSTAPE*INBUSTAPE         00364  01372 01410
   .     00366             ENT  A*W(INBU)*ANOT                 00365  11530 01414
   .     00367             JP   READSTC1                       00366  61000 00250
   .     00370             JP   COMPST                         00367  61000 00313
   .     00371 NOTONTAPE   RJP  U(INTERCOM)                    00370  65020 63426
   .     00372             U-TAG     NOTTAPE*0               00371  01312 00000
   .     00373             JP   COMPST                         00372  61000 00313
   .     00374 CONTFR      ENT  Q*U(FRBEG+1)                   00373  10020 01277  CONTINUE PROCESS FIRST RECORD

   .     00375             ENT  LP*W(DAYNOMA)                  00374  40030 01415
   .     00376             STR  A*W(TEMP)                      00375  15030 01221
   .     00377             ENT  A*L(DAY)                       00376  11010 63150
   .     00400             SUB  A*W(TEMP)*APOS                 00377  21630 01221
   .     00401             JP   NOTONTAPE                      00400  61000 0037C
   .     00402             AOD  A*1                            00401  20000 00001
   .     00403             STR  A*W(DAYNUDIFF)                 00402  15030 01416
   .     00404             ENT  B6*L(DAYNUDIFF)                00403  12610 01416
   .     00405             ENT  A*W(LAREC)                     00404  11030 01417
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CAROS	L1	IO	LABEL	TA	STATEMENT	LOC	F	JKB	Y	NOTES
.	00406				STR A*W(35)	00405	15	030	00035	
.	00407				IN C15*W(LREC)	00406	73	670	01420	
.	00410				ENT A*W(LREC)	00407	11	030	01420	
.	00411				EX-FCT C15*5200000002	00410	13	670	01771	
.	00412				COM A*W(115)*YMORE	00411	04	730	00115	
.	00413				JP $-1	00412	61	000	00411	
.	00414				BJP B6*$+2	00413	72	600	00415	
.	00415				JP $	00414	61	000	00414	
.	00416				STR A*W(115)	00415	15	030	00115	
.	00417				JP $-5	00416	61	000	00411	
.	00420		ALLREAO		STR C15*W(TEMP)	00417	17	670	01221	
.	00421				RJP STATCK	00420	65	000	00335	
.	00422				ENT A*W(TAPESTAT)	00421	11	030	01311	
.	00423				CL W(FRINOIC)	00422	16	030	01422	
.	00424				SUB A*80*ANOT	00423	21	500	00010	
.	00425				JP CONTAOK1	00424	61	000	00433	
.	00426				SUB A*1*ANOT	00425	21	500	00001	
.	00427				JP TAPEBUST	00426	61	000	00353	PARITY
.	U0430				ENT A*W(SECINOIC)*AZERO	00427	11	430	01421	
.	00431				JP TAPEBUST	00430	61	000	00353	FAIL ON PARITY
.	00432				RPL Y+1*W(SECINOIC)	00431	36	030	01421	
.	00433				JP READSTC1	00432	61	000	00250	TRY ONCE MORE
.	00434		CONTAOK1		ENT A*W(LREC)	00433	11	030	01420	
.	00435				COM A*W(115)*YMORE	00434	04	730	00115	
.	00436				JP NOTONTAPE	00435	61	000	00370	
.	00437		CONTAOK		ENT A*W(SAVE35)	00436	11	030	01272	
.	00440				STR A*W(35)	00437	15	030	00035	
.	00441				ENT A*W(FRBEG+1)	00440	11	030	01277	
.	00442				STR A*W(DAY1)	00441	15	030	01156	
.	00443				SUB A*W(FRBEG)*APOS	00442	21	630	01276	
.	00444				AOO A*W(THSIXTY)	00443	20	030	01162	
.	00445				AOO A*W(THSIXTY)	00444	20	030	01162	
.	00446				STR A*W(DIFF1)	00445	15	030	01152	
.	00447				ENT A*W(FRBEG+2)	00446	11	030	01300	
.	00450				STR A*W(DAY2)	00447	15	030	01157	
.	00451				SUB A*W(FRBEG+1)*APOS	00450	21	630	01277	
.	00452				AOO A*W(THSIXTY)	00451	20	030	01162	
.	00453				AOO A*W(THSIXTY)	00452	20	030	01162	
.	00454				STR A*W(DIFF2)	00453	15	030	01153	
.	00455				ENT A*W(FRBEG)	00454	11	030	01276	
.	00456				STR A*W(DAYO)	00455	15	030	01155	
.	00457				RJP SITEANGLE	00456	65	000	01075	
.	00460				ENT A*W(COCONX)	00457	11	030	00000	
.	00461				STR A*W(COCON)	00460	15	030	63414	
.	00462				CL W(INTERREW)	00461	16	030	01364	
.	00463				CL W(INTERFR)	00462	16	030	01371	
.	00464				CL W(INBU)	00463	16	030	01414	
.	00465				RILJP L(INIT)	00464	60	110	00002	END OF INITIALIZATION
.	00466		REGULAR		JP REGULAR	00465	61	000	00465	EXIT FROM WORKING PROGRAM
.	00467				RJP SITEANGLE	00466	65	000	01075	
.	00470		TRIGFUNC		ENT Q*W(SOEC)*QPOS	00467	10	230	63005	
.	00471				JP TRIGFUNC2	00470	61	000	00474	
.	00472		TRIGFUNC1		SUB Q*W(WNEREV)*QPOS	00471	27	630	01202	

CAROS	L1	IO	LABEL	TA	STATEMENT	LOC	F	JKB	Y	NOTES
.	00473			JP	TRIGFUNC2	00472	61000		00474	
.	00474			JP	TRIGFUNC1	00473	61000		00471	
.	00475		TRIGFUNC2	AOO	Q*W(WNEREV)*QPOS	00474	26630		01202	
.	00476			JP	TRIGFUNC2	00475	61000		00474	
.	00477			ENT	LP*W(REVMASK)	00476	40030		01203	
.	00500			ENT	Q*A	00477	10070		00000	
.	00501			MUL	W(THSIXTY)	00500	22030		01162	
.	00502			LSH	AQ*3	00501	07000		00003	B26
.	00503			STR	A*W(OELTAS)	00502	15030		01175	
.	00504		TRIGFUNC3	ENT	Q*W(SRA)*QPOS	00503	10230		63004	
.	00505			JP	TRIGFUNC5	00504	61000		00510	
.	00506		TRIGFUNC4	SUB	Q*W(WNEREV)*QPOS	00505	27630		01202	
.	00507			JP	TRIGFUNC5	00506	61000		00510	
.	00510			JP	TRIGFUNC4	00507	61000		00505	
.	00511		TRIGFUNC5	AOO	Q*W(WNEREV)*QPOS	00510	26630		01202	
.	00512			JP	TRIGFUNC5	00511	61000		00510	
.	00513			ENT	LP*W(REVMASK)	00512	40030		01203	
.	00514			ENT	Q*A	00513	10070		00000	
.	00515			MUL	W(THSIXTY)	00514	22030		01162	
.	00516			LSH	AQ*3	00515	07000		00003	
.	00517			STR	A*W(ALPHAS)	00516	15030		01200	B26
.	00520			ENT	Q*W(TRIGSCALF)	00517	10030		01176	
.	00521			RJP	SIN	00520	65000		01453	
.	00522			STR	A*W(SINALPHAS)	00521	15030		01165	B28
.	00523			ENT	Q*W(TRIGSCALF)	00522	10030		01176	
.	00524			ENT	A*W(OELTAS)	00523	11030		01175	
.	00525			RJP	COS	00524	65000		01442	
.	00526			STR	A*W(COSOELS)	00525	15030		01177	
.	00527			ENT	A*W(OELTAS)	00526	11030		01175	
.	00530			ENT	Q*W(TRIGSCALF)	00527	10030		01176	
.	00531			RJP	SIN	00530	65000		01453	
.	00532			STR	A*W(SINOELS)	00531	15030		01164	
.	00533			ENT	A*W(ALPHAS)	00532	11030		01200	
.	00534			ENT	Q*W(TRIGSCALF)	00533	10030		01176	
.	00535			RJP	COS	00534	65000		01442	
.	00536			STR	A*W(COSALPHAS)	00535	15030		01201	
.	00537			ENT	A*W(ALPHAS)	00536	11030		01200	
.	00540			SUB	A*W(SITEORAG)*APOS	00537	21630		01204	INSURE POSIT ANGLE
.	00541			AOO	A*W(THSIXTY)	00540	20030		01162	
.	00542			STR	A*W(SATMSITE)	00541	15030		01205	
.	00543			ENT	Q*W(TRIGSCALF)	00542	10030		01176	
.	00544			RJP	SIN	00543	65000		01453	
.	00545			STR	A*W(SINAMO)	00544	15030		01166	
.	00546			ENT	A*W(SATMSITE)	00545	11030		01205	
.	00547			ENT	Q*W(TRIGSCALF)	00546	10030		01176	
.	00550			RJP	COS	00547	65000		01442	
.	00551			STR	A*W(COSAMO)	00550	15030		01206	B28
.	00552		RTEST	ENT	A*W(RADIUS)*ANOT	00551	11530		63006	RANGE TEST
.	00553			JP	RSTAR	00552	61000		00625	STAR RANGE IS ZERO
.	00554			ENT	A*W(RADIUS)*APOS	00553	11630		63006	
.	00555			CP	A*	00554	15040		00000	UNITS ARE IN AU
.	00556			STR	A*W(RS)	00555	15030		01253	
.	00557			ENT	A*W(REQUAL1)	00556	11030		01222	

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CAROS    L1 IO LABEL      TA STATEMENT                    LOC    F JKB Y      NOTES

   .     00560            CL   Q*                         00557  10000 00000
   .     00561            DIV  W(RS)                      00560  23030 01253
   .     00562            STR  Q*W(TEMP)                  00561  14030 01221  RAOII B28 AU B26 (1/RS)
   .     00563            STR  Q*W(RAORECIP)              00562  14030 01423
   .     00564            ENT  Q*W(OE)                    00563  10030 01223  ER AND AU,B30
   .     00565            MUL  W(TEMP)                    00564  22030 01221  PROOUCT HAS B58 WHEN ER, B56 W
                                                                                HEN AU
   .     00566            STR  A*W(OERS)                  00565  15030 01171
   .     00567            ENT  Q*W(RE)                    00566  10030 01224
   .     00570            MUL  W(TEMP)                    00567  22030 01221  PROOUCT HAS B57 ER , B55 AU
   .     00571            LSH  AQ*1                       00570  07000 00001
   .     00572            STR  A*W(RERS)                  00571  15030 01172  B28 ER , B26 AU
   .     00573            ENT  Q*W(K3)                    00572  10030 01225
   .     00574            MUL  W(TEMP)                    00573  22030 01221  B57 ER  ZERO AU
   .     00575            LSH  AQ*310                     00574  07000 00037  B28 ER  ZERO AL
   .     00576            MUL  W(TEMP)                    00575  22030 01221
   .     00577            STR  A*W(SQRAO)                 00576  15030 01252  K3/RAOIUS$$2  B28
   .     00600            ENT  Q*W(K2)                    00577  10030 01226
   .     00601            MUL  W(COSOELS)                 00600  22030 01177  B56
   .     00602            LSH  AQ*320                     00601  07000 00040  B28
   .     00603            MUL  W(COSAMO)                  00602  22030 01206  B56
   .     00604            LSH  AQ*2                       00603  07000 00002
   .     00605            STR  A*W(RSPRIME)               00604  15030 01167  COSOELS$COS(ALPHAS-ORAGONE)$K2
                                                                                  B28
   .     00606            STR  A*W(BROOT)                 00605  15030 01425
   .     00607            ENT  Q*W(K1)                    00606  10030 01227  B28
   .     00610            MUL  W(SINOELS)                 00607  22030 01164  B56
   .     00611            LSH  AQ*2                       00610  07000 00002
   .     00612            STR  A*W(AROOT)                 00611  15030 01424
   .     00613            SUB  A*W(RSPRIME)               00612  21030 01167
   .     00614            LSH  AQ*300                     00613  07000 00036  B28
   .     00615            MUL  W(TEMP)                    00614  22030 01221  B56
   .     00616            AOO  A*W(HALFREV)               00615  20030 01244
   .     00617            AOO  A*W(SQRAO)*APOS            00616  20630 01252
   .     00620 NEGRSP     JP   NEGRSP                     00617  61000 00617
   .     00621            RJP  SQRT                       00620  65000 01561
   .     00622 NEGRSP1    JP   NEGRSP1                    00621  61000 00621
   .     00623            LSH  AQ*1                       00622  07000 00001  RETURN HAS B27
   .     00624            STR  A*W(RSPRIME)               00623  15030 01167  (1+((K1$SOS)-K2$COS$C(A-5))/RS
                                                                                +K3/RS$$2)
   .     00625            JP   COMZRP                     00624  61000 00631  COMPUTE ZR PRIME
   .     00626 RSTAR      ENT  A*W(WON)                   00625  11030 01230
   .     00627            STR  A*W(RSPRIME)               00626  15030 01167
   .     00630            CL   W(RERS)                    00627  16030 01172
   .     00631            CL   W(DERS)                    00630  16030 01171
   .     00632 COMZRP     ENT  Q*W(SINDELS)               00631  10030 01164
   .     00633            MUL  W(SINPHEE)                 00632  22030 01232  B57
   .     00634            LSH  AQ*2                       00633  07000 00002
   .     00635            STR  A*W(TEMPA)                 00634  15030 01233  B28
   .     00636            ENT  Q*W(COSOELS)               00635  10030 01177
   .     00637            MUL  W(COSPHEE)                 00636  22030 01231
   .     00640            LSH  AQ*320                     00637  07000 00040  B29
   .     00641            MUL  W(COSAMO)                  00640  22030 01206  B57
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CAROS	L1 IO	LABEL	TA	STATEMENT	LOC	F JKB Y	NOTES
.	00642		LSH	AQ*2	00641	07000 00002	
.	00643		AOO	A*W(TEMPA)	00642	20030 01233	
.	00644		SUB	A*W(RERS)	00643	21030 01172	
.	00645		STR	A*W(ZRPRIME)	00644	15030 01170	B28
.	00646		ENT	Q*W(RADIUS)*QPOS	00645	10230 63006	
.	00647		CP	Q	00646	14000 00000	
.	00650		MUL	W(RSPRIME)	00647	22030 01167	B50 ER, B52 AU
.	00651		LSH	AQ*310	00650	07000 00037	B21 ER, B24 AU
.	00652		LSH	AQ*1	00651	07000 00001	
.	00653		STR	Q*W(TEMP)	00652	14030 01221	
.	00654		RSH	Q*1	00653	01000 00001	
.	00655		MUL	W(RANGECON)	00654	22030 01234	B19 ER AND AU
.	00656		LSH	AQ*1	00655	07000 00001	
.	00657		STR	A*W(RANGE)	00656	15030 63052	B00 RANGE IN B UNITS
.	00660		ENT	Q*W(TEMP)	00657	10030 01221	
.	00661		ENT	A*W(SYSTAT2)*APOS	00660	11630 63314	
.	00662		CP	Q*	00661	14000 00000	
.	00663		STR	Q*W(TRUERANGE)	00662	14030 63063	
.	00664	COMPELEV	CL	Q*	00663	10000 00000	COMPUTE ELEVATION
.	00665		ENT	A*W(ZRPRIME)	00664	11030 01170	B58
.	00666		RSH	AQ*2	00665	03000 00002	B56
.	00667		DIV	W(RSPRIME)	00666	23030 01167	B28
.	00670		LSH	AQ*300	00667	07000 00036	
.	00671		ENT	Q*W(B28)	00670	10030 01237	
.	00672		RJP	ASIN	00671	65000 01625	
.	00673	ASINERROR	JP	ASINERROR	00672	61000 00672	
.	00674		LSH	AQ*300	00673	07000 00036	B27
.	00675		MUL	W(ELEVCON)	00674	22030 01240	B57
.	00676		STR	A*W(ELEV)	00675	15030 63054	
.	00677	COMPAZIM	ENT	A*W(SATMSITE)*ANOT	00676	11530 01205	COMPUTE AZIMUTH
.	00700		JP	AMDZERO	00677	61000 01067	
.	00701		ENT	Q*W(COSOELS)	00700	10030 01177	
.	00702		MUL	W(SINAMD)	00701	22030 01166	B56
.	00703		LSH	AQ*2	00702	07000 00002	B58
.	00704		STR	A*W(CROOT)	00703	15030 01426	
.	00705		STR	A*W(EX1)	00704	15030 01173	B28
.	00706		ENT	A*W(OELTAS)	00705	11030 01175	B26
.	00707		SUB	A*W(NINTYOEG)*ANOT	00706	21530 01241	
.	00710		JP	SETAZIMO	00707	61000 01051	OELS IS +90 DEG. SET AZIM ZERO
.	00711		ENT	A*W(DELTAS)	00710	11030 01175	
.	00712		CP	A*	00711	15040 00000	
.	00713		SUB	A*W(NINTYOEG)*ANOT	00712	21530 01241	
.	00714		JP	SETAZIMPI	00713	61000 01053	OELS IS -90 OEG SET AZIM 180 O EG
.	00715		ENT	Q*W(COSOELS)	00714	10030 01177	B28
.	00716		MUL	W(SINPHEE)	00715	22030 01232	B56
.	00717		LSH	AQ*310	00716	07000 00037	
.	00720		MUL	W(COSAMO)	00717	22030 01206	B56
.	00721		LSH	AQ*3	00720	07000 00003	
.	00722		STR	A*W(TEMP)	00721	15030 01221	B28
.	00723		ENT	Q*W(SINOELS)	00722	10030 01164	
.	00724		MUL	W(COSPHEE)	00723	22030 01231	

CAROS	L1 IO	LABEL	TA	STATEMENT	LOC	F JKB Y	NOTES
.	00725		LSH	AQ*320	00724	07000 00040	
.	00726		SUB	Q*W(TEMP)	00725	27030 01221	
.	00727		AOD	Q*W(DERS)	00726	26030 01171	
.	00730		STR	Q*W(EX2)*QPOS	00727	14230 01174	B28
.	00731		CP	Q*	00730	14000 00000	
.	00732		STR	Q*W(MAGEX2)	00731	14030 01242	BZ28
.	00733		LSH	AQ*300	00732	07000 00036	
.	00734		JP	EX2ZERO*AZERO	00733	60400 01056	
.	00735		ENT	A*W(EX1)*APOS	00734	11630 01173	
.	00736		CP	A*	00735	15040 00000	
.	00737		ENT	Q*W(MAGEX2)	00736	10030 01242	
.	00740		RJP	ATAN	00737	65000 01664	
.	00741		RSH	AQ*1	00740	03000 00001	
.	00742		STR	A*W(AZI)	00741	15030 01243	B26 IN RADIANS
.	00743		ENT	A*W(EX1)*ANEG	00742	11730 01173	
.	00744		JP	EX1POS	00743	61000 00762	
.	00745		ENT	A*W(EX2)*ANEG	00744	11730 01174	
.	00746		JP	EX1NEX2P	00745	61000 00754	
.	00747	EX1NEX2N	ENT	Q*W(AZI)	00746	10030 01243	
.	00750		AOD	Q*W(PI)	00747	26030 01245	B26
.	00751		MUL	W(ELEVCON)	00750	22030 01240	B56
.	00752		LSH	AQ*1	00751	07000 00001	B57
.	00753		STR	A*W(AZIM)	00752	15030 63053	B27
.	00754		JP	EXITA	00753	61000 00776	
.	00755	EX1NEX2P	ENT	Q*W(TWOPI)	00754	10030 01247	
.	00756		SUB	Q*W(AZI)	00755	27030 01243	
.	00757		MUL	W(ELEVCON)	00756	22030 01240	
.	00760		LSH	AQ*1	00757	07000 00001	
.	00761		STR	A*W(AZIM)	00760	15030 63053	
.	00762		JP	EXITA	00761	61000 00776	
.	00763	EX1POS	ENT	Q*W(EX2)*QNEG	00762	10330 01174	
.	00764		JP	EX1PEX2P	00763	61000 00772	
.	00765	EX1PEX2N	ENT	Q*W(PI)	00764	10030 01245	
.	00766		SUB	Q*W(AZI)	00765	27030 01243	
.	00767		MUL	W(ELEVCON)	00766	22030 01240	
.	00770		LSH	AQ*1	00767	07000 00001	
.	00771		STR	A*W(AZIM)	00770	15030 63053	
.	00772		JP	EXITA	00771	61000 00776	
.	00773	EX1PEX2P	ENT	Q*W(AZI)	00772	10030 01243	
.	00774		MUL	W(ELEVCON)	00773	22030 01240	
.	00775		LSH	AQ*1	00774	07000 00001	
.	00776		STR	A*W(AZIM)	00775	15030 63053	
.	00777	EXITA	CL	Q	00776	10000 00000	
.	01000		ENT	A*W(RADIUS)	00777	11030 63006	B52ER B54AU
.	01001		RSH	AQ*5	01000	03000 00005	
.	01002		DIV	W(TRUERANGE)	01001	23030 63063	
.	01003		STR	Q*W(COEFRDOT)	01002	14030 01207	
.	01004		ENT	Q*W(ARDOT)	01003	10030 01424	
.	01005		MUL	W(RADRECIP)	01004	22030 01423	
.	01006		AOD	A*W(WNEREV)	01005	20030 01202	
.	01007		STR	A*W(TEMPOOP)	01006	15030 0121C	
.	01010		ENT	Q*W(BRDOT)	01007	10030 01425	
.	01011		MUL	W(RADRECIP)	01010	22030 01423	

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CARDS    L1 ID LABEL      TA STATEMENT                          LOC    F JKB Y      NOTES
   .     01012            CP   A*                               01011  15040 00000
   .     01013            ADD  A*W(TEMPDOP)                     01012  20030 01210
   .     01014            LSH  AQ*300                           01013  07000 00036
   .     01015            MUL  W(RADIUSDOT)                     01014  22030 63011
   .     01016            STR  A*W(DOPA)                        01015  15030 01211
   .     01017            ENT  Q*W(K1DOP)                       01016  10030 01215
   .     01020            MUL  W(COSDELS)                       01017  22030 01177
   .     01021            LSH  AQ*1                             01020  07000 00001
   .     01022            STR  A*W(DOP8)                        01021  15030 01212
   .     01023            ENT  Q*W(K2DOP)                       01022  10030 01216
   .     01024            MUL  W(SINDELS)                       01023  22030 01164
   .     01025            LSH  AQ*31D                           01024  07000 00037
   .     01026            MUL  W(COSAMD)                        01025  22030 01206
   .     01027            LSH  AQ*32D                           01026  07000 0004C
   .     01030            ADD  Q*W(DOP8)                        01027  26030 01212
   .     01031            MUL  W(DECDOT)                        01030  22030 63010
   .     01032            STR  A*W(DOP8)                        01031  15030 01212
   .     01033            ENT  Q*W(RADOT)                       01032  10030 63007
   .     01034            SUB  Q*W(DRAGONDOT)                   01033  27030 0122C
   .     01035            MUL  W(CROOT)                         01034  22030 01426
   .     01036            LSH  AQ*31D                           01035  07000 00037
   .     01037            MUL  W(K2DOP)                         01036  22030 01216
   .     01040            LSH  AQ*30D                           01037  07000 00036
   .     01041            STR  Q*W(DOPC)                        01040  14030 01213
   .     01042            ADD  Q*W(DOP8)                        01041  26030 01212
   .     01043            RSH  Q*2                              01042  01000 00002
   .     01044            ADD  Q*W(DOPA)                        01043  26030 01211
   .     01045            MUL  W(COEFROOT)                      01044  22030 01207
   .     01046            STR  A*W(DOPD)                        01045  15030 01214
   .     01047            LSH  AQ*8D                            01046  07000 0001C
   .     01050            STR  A*W(RANGEOOT)                    01047  15030 63062
   .     01051            RILJP     L(REGOLAR)                  01050  60110 00465
   .     01052 SETAZIMO   CL   W(AZIM)*                         01051  16030 63053
   .     01053            JP   EXITA                            01052  61000 00776
   .     01054 SETAZIMPI  ENT  A*W(HALFREV)                     01053  11030 01244
   .     01055            STR  A*W(AZIM)                        01054  15030 63053
   .     01056            JP   EXITA                            01055  61000 00776
   .     01057 EX2ZERO    ENT  A*W(ALPHAS)                      01056  11030 01200
   .     01060            SUB  A*W(SITEDRAG)*APOS               01057  21630 01204
   .     01061            JP   SET270                           01060  61000 01064
   .     01062 SET90      ENT  A*W(QUARTREV)                    01061  11030 01246
   .     01063            STR  A*W(AZIM)                        01062  15030 63053
   .     01064            JP   EXITA                            01063  61000 00776
   .     01065 SET270     ENT  A*W(THQUAREV)                    01064  11030 01250
   .     01066            STR  A*W(AZIM)                        01065  15030 63053
   .     01067            JP   EXITA                            01066  61000 00776
   .     01070 AMDZERO    ENT  A*W(DELTAS)                      01067  11030 01175
   .     01071            CL   W(CROOT)                         01070  16030 01426
   .     01072            SUB  A*W(PHEE)*ANOT                   01071  21530 01251
   .     01073            JP   SETAZIMO                         01072  61000 01051
   .     01074            JP   SETAZIMO*APOS                    01073  60600 01051
   .     01075            JP   SETAZIMPI                        01074  61000 01053
   .     01076 SITEANGLE  ENTRY                                 01075  61000 0000C
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CARDS	L1	IO	LABEL	TA	STATEMENT	LOC	F	JKB	Y	NOTES
.	01077		HOURANGLE		ENT A*W(CONVERTIME)*ANOT	01076	11530	63135		FIND LOCAL HOUR ANGLE
.	01100				JP SETO	01077	61000	01142		
.	01101				COM A*W(DAYONE)*YLESS	01100	04630	01151		
.	01102				JP BETOA1	01101	61000	01106		
.	01103				ENT A*W(DIFF2)	01102	11030	01153		B26
.	01104				STR A*W(DIFF)	01103	15030	01154		
.	01105				ENT A*W(DAY1)	01104	11030	01156		
.	01106				JP INTERP	01105	61000	01111		
.	01107		BETOA1		ENT A*W(DIFF1)	01106	11030	01152		
.	01110				STR A*W(DIFF)	01107	15030	01154		
.	01111				ENT A*W(DAYO)	01110	11030	01155		B26
.	01112		INTERP		STR A*W(BEG)	01111	15030	01160		
.	01113				ENT A*W(DIFF)	01112	11030	01154		
.	01114				CL Q	01113	10000	00000		
.	01115				RSH AQ*7	01114	03000	00007		
.	01116				DIV W(SECINDAY)	01115	23030	01217		
.	01117				STR Q*W(DRAGONDOT)	01116	14030	01220		
.	01120				ENT Q*W(CONVERTIME)*QPDS	01117	10230	63135		
.	01121				JP NEGTIME	01120	61000	01131		
.	01122				ENT LP*W(FRACMASK)	01121	40030	01161		
.	01123				LSH AQ*30D	01122	07000	00036		
.	01124				MUL W(DIFF)	01123	22030	01154		
.	01125				LSH AQ*2	01124	07000	00002		B26
.	01126				SUB A*W(THSIXTY)	01125	21030	01162		TO INSURE NO OVERFLOW
.	01127				ADD A*W(BEG)*APOS	01126	20630	01160		
.	01130				ADD A*W(THSIXTY)	01127	20030	01162		
.	01131				JP ADDSITE	01130	61000	01143		
.	01132		NEGTIME		CP Q*	01131	14000	00000		
.	01133				ENT LP*W(FRACMASK)	01132	40030	01161		
.	01134				LSH AQ*30D	01133	07000	00036		
.	01135				MUL W(DIFF)	01134	22030	01154		
.	01136				LSH AQ*2	01135	07000	00002		
.	01137				CP A	01136	15040	00000		
.	01140				ADD A*W(BEG)*APOS	01137	20630	01160		
.	01141				ADD A*W(THSIXTY)	01140	20030	01162		
.	01142				JP ADDSITE	01141	61000	01143		
.	01143		SETO		ENT A*W(DAYO)	01142	11030	01155		
.	01144		ADDSITE		SUB A*W(THSIXTY)	01143	21030	01162		TO INSURE NO OVERFLOW
.	01145				ADD A*W(SITELONG)*APOS	01144	20630	01163		
.	01146				ADD A*W(THSIXTY)	01145	20030	01162		
.	01147				STR A*W(SITEORAG)	01146	15030	01204		
.	01150				STR A*W(SIDERTIME)	01147	15030	63012		
.	01151				EXIT	01150	61010	01075		
.	01152		DAYONE		20000 00000	01151	20000	00000		B28
.	01153		DIFF1		31103 75523	01152	31103	75523		
.	01154		DIFF2		31103 75523	01153	31103	75523		
.	01155		DIFF		0 0	01154	00000	00000		
.	01156		DAYO		0 0	01155	00000	00000		DAY 0 HOUR ANGLE B26
.	01157		DAY1		0 0	01156	00000	00000		DAY 1
.	01160		DAY2		0 0	01157	00000	00000		DAY 2
.	01161		BEG		0 0	01160	00000	00000		LOCAL HOUR ANGLE BEGINN THIS D AY
.	01162		FRACMASK		17777 77777	01161	17777	77777		FRACTION OF DAY

CAROS	L1 IO	LABEL	TA	STATEMENT	LOC	F	JKB	Y	NOTES
.	01163	THSIXTY		3110375523	01162	31103	75523		OEC 6.2831853B26 2P I B26
.	01164	SITELONG	0	0	01163	00000	00000		
.	01165	SINOELS	0	0	01164	00000	00000		B2B
.	01166	SINALPHAS	0	0	01165	00000	00000		B2B
.	01167	SINAMO	0	0	01166	00000	00000		B2B
.	01170	RSPRIME	0	0	01167	00000	00000		B2B
.	01171	ZRPRIME	0	0	01170	00000	00000		
.	01172	OERS	0	0	01171	00000	00000		B2B WHEN ER,B26 WHEN AU
.	01173	RERS	0	0	01172	00000	00000		
.	01174	EX1	0	0	01173	00000	00000		B2B
.	01175	EX2	0	0	01174	00000	00000		
.	01176	OELTAS	0	0	01175	00000	00000		OECLINATION OF OBJECT TO BE OB SERVED B26
.	01177	TRIGSCALF		0000000032	01176	00000	00032		OEC 26B0
.	01200	COSOELS	0	0	01177	00000	00000		B2B
.	01201	ALPHAS	0	0	01200	00000	00000		RIGHT ASCENSION OF OBJECT B26
.	01202	COSALPHAS	0	0	01201	00000	00000		B2B
.	01203	WNEREV	10000	0	01202	10000	00000		ONE REVOLUTION B27
.	01204	REVMASK	07777	77777	01203	07777	77777		
.	01205	SITEORAG	0	0	01204	00000	00000		
.	01206	SATMSITE	0	0	01205	00000	00000		
.	01207	COSAMO	0	0	01206	00000	00000		B2B
.	01210	COEFROOT	0	0	01207	00000	00000		
.	01211	TEMPOOP	0	0	01210	00000	00000		
.	01212	OOPA	0	0	01211	00000	00000		
.	01213	OOPB	0	0	01212	00000	00000		
.	01214	OOPC	0	0	01213	00000	00000		
.	01215	OOPO	0	0	01214	00000	00000		
.	01216	K1OOP	0	0	01215	00000	00000		
.	01217	K2OOP	0	0	01216	00000	00000		
.	01220	SECINOAY	25060	0	01217	25060	00000		
.	01221	ORAGONOOT	0	0	01220	00000	00000		
.	01222	TEMP	0	0	01221	00000	00000		
.	01223	REQUAL1	00040	0	01222	00040	00000		1 WITH B20
.	01224	OE	0	0	01223	00000	00000		SET BY INIT
.	01225	RE	0	0	01224	00000	00000		SET BY INIT
.	01226	K3	0	0	01225	00000	00000		SET BY INIT
.	01227	K2	0	0	01226	00000	00000		SET BY INIT
.	01230	K1	0	0	01227	00000	00000		SET BY INIT
.	01231	WON		2000000000	01230	20000	00000		OEC 1.0B2B
.	01232	COSPHEE		2743221664	01231	27432	21664		OEC .73597894B29
.	01233	SINPHEE		2552402461	01232	25524	02461		OEC .67700443B29
.	01234	TEMPA	0	0	01233	00000	00000		
.	01235	RANGECON	0	0	01234	00000	00000		
.	01236	RACONEARAO	03175	36435	01235	03175	36435		BB 1 ER = 212,669.1136 BUNITS
.	01237	RACONAO	0	0	01236	00000	00000		
.	01240	B2B		0000000034	01237	00000	00034		OEC 2B80 B FACTOR FOR ARCSIN
.	01241	ELEVCON		1213714063	01240	12137	14063		OEC .15915494B30 CH ANGE ELEV FROM RAOIA

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CARDS    L1 ID LABEL      TA STATEMENT                                LOC    F JKB Y      NOTES
   .     01242 NINTYDEG      0622077323                             01241  06220 77323  DEC       1.5707963826      PI
                                                                                         /2 826
   .     01243 MAGEX2        0    0                                 01242  00000 00000
   .     01244 AZI           0    0                                 01243  00000 00000
   .     01245 HALFREV       04000     0                            01244  04000 00000
   .     01246 PI            1444176655                             01245  14441 76655  DEC       3.1415927826      B2
                                                                                         6
   .     01247 QUARTREV      02000     0                            01246  02000 00000
   .     0125D TWOPI         3110375523                             01247  31103 75523  DEC       6.2831853826      B2
                                                                                         6
   .     01251 THQUAREV      D60D0     0                            01250  06000 00000
   .     01252 PHEE          0276304201                             01251  02763 04201  DEC       .74368479826      B2
                                                                                         6 IN RADIANS
   .     01253 SQRAD         0    0                                 01252  00000 00000
   .     01254 RS            D    0                                 01253  00000 00000
   .     01255 DEGRAD        DD43575D63                             01254  00435 75063  DEC       .01745329829
   .     01256 TANPHEE       D    0                                 01255  00000 00000  B27
   .     01257 AA            02000     0                            01256  02000 00000
   .     01260 DELLAT        D    0                                 01257  00000 00000  GEOCENIC LATITUDE IN RADIANS B
                                                                                         26
   .     01261 FLATSQ        3762166717                             01260  37621 66717  DEC       .99327746829      (1
                                                                                         -F)$$2
   .     01262 UNINBIT24     01000     0                            01261  01000 00000  ONE IN BIT 24
   .     01263 CAPRE         0    0                                 01262  00000 00000
   .     01264 FTTOER        00000     00005                        01263  00000 00005
   .     01265 ERTOAU        0000D5    45713                        01264  00005 45713  ER TO AU .0000426648 B32
   .     01266 FTTOAU        0    0                                 01265  00000 00000
   .     01267 PHEEMDEL      0    0                                 01266  00000 00000  B26 IN RADIANS
   .     01270 SINPHEMDEL    0    0                                 01267  00000 00000
   .     01271 COSPHEMDEL    D    0                                 01270  00000 00000
   .     01272 COSDELLAT     0    0                                 01271  00000 00000
   .     01273 SAVE35        0    0                                 01272  00000 00000
   .     01274 REWANS        JP   REWANS1                           01273  61000 00255
   .     01275 READFR        JP   FRREAD                            01274  61000 00273
   .     01276 FREC          U-TAG     FREND*FRBEG                  01275  01310 01276
   .     01277 FRBEG         0    0                                 01276  00000 00000
   .     01300               0    0                                 01277  00000 00000
   .     01301 LRECEND       0    0                                 01300  00000 00000
   .     01302               0                                      01301  00000 00000
   .     01303               0                                      01302  00000 00000
   .     01304               0                                      01303  00000 00000
   .     013D5               0                                      01304  00000 00000
   .     01306               0                                      01305  00000 00000
   .     01307               D                                      01306  00000 00000
   .     01310               U                                      01307  00000 00000
   .     01311 FRENO         0    0                                 01310  00000 00000
   .     01312 TAPESTAT      0    0                                 01311  00000 00000
   .     01313 NOTTAPE       FD   0*A                               01312  06050 50505
   .     01314               77777     NOTTAPA                      01313  77777 01314
   .     01315 NOTTAPA       FD   0*NO SIDEREAL TIME FOR THIS DATE  01314  23240 53016
                                                                    01315  11122 71206
                                                                    01316  21053 11622
                                                                    01317  12051 32427
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CARDS	L1	IO	LABEL	TA	STATEMENT	LOC	F JKB Y	NOTES
						01320	05311 51630	
						01321	05110 63112	
.	01316				77777 77777	01322	77777 77777	
.	01317		REMESS		FO O*A	01323	06050 50505	
.	01320				77777 REMESSA	01324	77777 01325	
.	01321		REMESSA		FO O*CANNOT REWIND SERVO 1	01325	10062 32324	
						01326	31052 71234	
						01327	16231 1053C	
						01330	12273 32405	
						01331	61050 50505	
.	01322				FO O*TRY AGAIN(O) COMPUTE S.T.(1)	01332	31273 60506	
						01333	14061 62351	
						01334	24400 51024	
						01335	22253 23112	
						01336	05307 53175	
						01337	51614 00505	
.	01323				77777 77777	01340	77777 77777	
.	01324		FRMESS		FO O*A	01341	06050 50505	
.	01325				77777 FRMESSA	01342	77777 01343	
.	01326		FRMESSA		FO O*FIRST FILE NOT SIOEREAL TIME TRY AGAIN(O) COMPUTE S.T.(1)	01343	13162 73031	
						01344	05131 62112	
						01345	05232 43105	
						01346	30161 11227	
						01347	12062 10531	
						01350	16221 20531	
						01351	27360 50614	
						01352	06162 35124	
						01353	40051 02422	
						01354	25323 11205	
						01355	30753 17551	
						01356	61400 50505	
.	01327				77777 77777	01357	77777 77777	
.	01330		INREMESS		FO 1*0	01360	11050 50505	
.	01331				11 INTERREW	01361	00011 01364	
.	01332				0 0	01362	00000 00000	
.	01333				0 1	01363	00000 00001	
.	01334		INTERREW		0 0	01364	00000 00000	
.	01335		INFRMESS		FO 1*0	01365	11050 50505	
.	01336				11 INTERFR	01366	00011 01371	
.	01337				0 0	01367	00000 00000	
.	01340				0 1	01370	00000 00001	
.	01341		INTERFR		0 0	01371	00000 0000C	
.	01342		BUSTAPE		FO O*A	01372	06050 50505	
.	01343				77777 BUSTAPEA	01373	77777 01374	
.	01344		BUSTAPEA		FO O*SERVO 1 TAPE STATUS	01374	30122 73324	
						01375	05610 53106	
						01376	25120 53031	
						01377	06313 23005	
.	01345		WRITSTAT		0 0	01400	00000 0000C	
.	01346				FO O*TRY AGAIN(O) COMPUTE S.T.(1)	01401	31273 60506	
						01402	14061 62351	
						01403	24400 51024	

CAROS	L1	IO	LABEL	TA	STATEMENT	LOC	F	JKB	Y	NOTES
						01404	22253	23112		
						01405	05307	53175		
						01406	51614	00505		
.	01347				77777 77777	01407	77777	77777		
.	01350		INBUSTAPE		FO 1*0	01410	11050	50505		
.	01351				11 INBU	01411	00011	01414		
.	01352				U 0	01412	00000	00000		
.	01353				0 1	01413	00000	00001		
.	01354		INBU		0 0	01414	00000	00000		
.	01355		OAYNOMA		0 777	01415	00000	00777		
.	01356		OAYNUOIFF		0 0	01416	00000	00000		
.	01357		LAREC		JP ALLREAO	01417	61000	00417		
.	01360		LREC		U-TAG LRECENO*FRBEG	01420	01300	01276		
.	01361		SECINOIC		0 0	01421	00000	000C0		
.	01362		FRINOIC		0 0	01422	00000	00000		
.	01363		RAORECIP		0 0	01423	00000	00000		
.	01364		AROOT		0 0	01424	00000	00000		
.	01365		BROOT		0 0	01425	00000	0000C		
.	01366		CROOT		0 0	01426	00000	00000		
.	01367		TEMPLAT		U252361523	01427	02523	61523	OEC	42.618820
										TO BE REMCVEO LAT
.	01370		TEMPLONG		2202020304	01430	22020	20304	OEC	288.508820
										TO BE REMOVEO LAT
.	01371		EQUAT		3270632274	01431	32706	32274	OEC	3441.603817
.	01372		PO		3263003656	01432	32630	03656	OEC	3430.015817
.	01373		HEI		0000000733	01433	00000	00733	OEC	475.080
.	01374		TWICEPHEE		0 0	01434	00000	00000		
.	01375		FOURPHEE		U 0	01435	00000	00000		
.	01376		K2PHEE		00033 50201	01436	00033	50201		RAOIANS B28
.	01377		K4PHEE		0 02767	01437	00000	02767		RAOIANS B1B
.	01400		K6PHEE		0 00003	01440	00000	00003		RAOIANS B28
.	01401		RAOTOOEG		34513 56032	01441	34513	56032		B23
.	01402		COS		JP COS	01442	61000	01442		ARBITRARY
.	01403				ENT B7*L(COS)	01443	12710	01442		STORE EXIT
.	01404				STR B7*L(SIN)	01444	16710	01453		
.	01405				ENT B7*1	01445	12700	00001		FLAG
.	01406				STR B7*L(SIN+420)	01446	16710	01525		
.	01407				JP COS+7*APOS	01447	60600	01451		
.	01410				CP A*	01450	15040	00000		
.	01411				JP SIN+2*ANOT	01451	60500	01455		
.	01412				ENT A*W(SIN+600)	01452	11030	01547		COS (0) 1
.	01413		SIN		JP SIN	01453	61000	01453		ARBITRARY
.	01414				STR B0*L(SIN+420)	01454	16010	01525		FLAG
.	01415				STR A*W(SIN+680)*APOS	01455	15630	01557		
.	01416				CP A*	01456	15040	00000		SET POSITIVE
.	01417				RPT 290	01457	70000	00035		
.	01420				LSH A*1*ANEG	01460	06700	00001		SHIFT ONTIL BIT 29 1
.	01421				JP L(SIN)	01461	61010	01453		SIN(X) 0
.	01422				LSH A*290	01462	06000	00035		SHIFT RIGHT 1
.	01423				SUB Q*B7*QPOS	01463	27607	000CC		QNEG IMPLIES X EXCEEDS PI/2
.	01424				JP SIN+340	01464	61000	01515		
.	01425				COM Q*300*YMORE	01465	04300	00036		PREVENT ILLEGITIMATE SHIFT

CAROS	L1 ID	LABEL	TA	STATEMENT	LOC	F	JKB	Y	NOTES
.	01426			ENT Q*300	01466	10000	00036		MAX SHIFT 30
.	01427			STR Q*L(SIN+130)	01467	14010	01470		SOTRE SHIFT COONT
.	01430			RSH A*0	01470	02000	00000		SCALE ARGUMENT AT 28
.	01431			COM A*W(SIN+590)*YMORE	01471	04730	01546		COMPARE WITH PI/2
.	01432			JP SIN+370	01472	61000	01520		REDUCE TO 1ST QUADRANT
.	01433			BSK 80*L(SIN+420)	01473	71010	01525		SKIP IF SINE
.	01434			SUB A*W(SIN+590)*SKIP	01474	21130	01546		PI/2-X TO A
.	01435			ENT Q*W(SIN+680)*QPOS	01475	10230	01557		CHECK SIGN
.	01436			CP A*	01476	15040	00000		A BEARS PROPER SIGN
.	01437			STR A*W(SIN+680)	01477	15030	01557		STORE SIGNED ARGUMENT
.	01440			ENT Q*A	01500	10070	00000		SCALED AT 28
.	01441			MUL W(SIN+680)	01501	22030	01557		X 2 AT 28+28 56
.	01442			RSH AQ*290	01502	03000	00035		SQUARED AT 27
.	01443			STR Q*W(SIN+690)	01503	14030	01560		STORE X 2
.	01444			ENT Q*W(SIN+640)	01504	10030	01553		C9
.	01445			ENT 87*3	01505	12700	00003		LOOP 4 TIMES
.	01446			MUL W(SIN+690)	01506	22030	0156C		SUM POLYNOMIAL
.	01447			ENT Q*A	01507	10070	00000		
.	01450			AOO Q*W(SIN+600+87)	01510	26037	01547		
.	01451			BJP 87*SIN+270	01511	72700	01506		
.	01452			MOL W(SIN+680)	01512	22030	01557		
.	01453			LSH AQ*2	01513	07000	00002		SCALE AT 28
.	01454			JP L(SIN)	01514	61010	01453		RETURN
.	01455			COM Q*X77741*YLESS	01515	04240	77741		CHECK FOR LEGIT SHIFT
.	01456			ENT Q*X77741	01516	10040	77741		-30
.	01457			STR Q*CPL(SIN+130)	01517	14050	01470		
.	01460			RSH AQ*2	01520	03000	00002		
.	01461			DIV W(SIN+590)	01521	23030	01546		FORM X/(PI/2)
.	01462			ENT A*0	01522	11000	00000		CLEAR A
.	01463			LSH AQ*L(SIN+130)	01523	07010	01470		
.	01464			LSH AQ*2	01524	07000	00002		INTEGER TO A, FRACTION IN Q
.	01465			AOO A*0	01525	20000	00000		0 FOR SIN , 1 FOR COS
.	01466			RSH AQ*2	01526	03000	00002		
.	01467			ENT LP*W(SIN+670)*ANOT	01527	40530	01556		
.	01470			ENT LP*W(SIN+600)*ANOT	01530	40530	01547		
.	01471			JP SIN+510	01531	61000	01536		
.	01472			SUB LP*W(SIN+660)	01532	42030	01555		
.	01473			ENT Q*W(SIN+680)*QPOS	01533	10230	01557		ACCORD SIGN
.	01474			CP A*	01534	15040	00000		
.	01475			JP L(SIN)	01535	61010	01453		
.	01476			ENT LP*W(SIN+650)*ODD	01536	40330	01554		
.	01477			JP SIN+560	01537	61000	01543		
.	01500			14200 0	01540	14200	00000		CP,Q,QPOS
.	01501			SOB Q*W(SIN+660)*SKIP	01541	27130	01555		
.	01502			AOO Q*W(SIN+660)	01542	26030	01555		
.	01503			MOL W(SIN+590)	01543	22030	01546		
.	01504			LSH AQ*2	01544	07000	00002		SCALE AT 28
.	01505			JP SIN+180	01545	61000	01475		RETURN
.	01506			31103 75524	01546	31103	75524		PI/2 AT 28
.	01507			20000 00000	01547	20000	00000		C1 1$0 AT 28
.	01510			52525 25600	01550	52525	25600		C3-0$1666 665669E00831
.	01511			10420 71732	01551	10420	71732		C5 0.833302518E-2834

CARDS	L1	ID	LABEL	TA	STATEMENT	LOC	F	JKB	Y	NOTES
.	01512				76301 15701	01552	76301		15701	C7-.1980741431E-3837
.	01513				00127 23405	01553	00127		23405	C9 0.26018B6909E-5B40
.	01514				60000 00000	01554	60000		00000	
.	01515				40000 00000	01555	40000		00000	
.	01516				17777 77777	01556	17777		77777	
.	01517				D 0	01557	00000		00000	TEMPORARY
.	01520				D 0	01560	00000		00000	TEMPORARY
.	01521		SQRT		JP SQRT	01561	61000		01561	ARBITRARY
.	01522				CL Q*	01562	10000		00000	CLEAR Q
.	01523				RPT 14D	01563	70000		00016	NORMALIZE
.	01524				RSH AQ*2*AZERO	01564	03400		00002	SHIFT UNTIL A 0
.	01525				JP L(SQRT)*ANOT	01565	60510		01561	ERROR,BIT 28 OR 29 1
.	01526				LSH AQ*28D	01566	07000		00034	NORMALIZE IN A
.	01527				STR A*W(SQRT+34D)*ANOT	01567	15530		01623	STORE NORMALIZED RADICAND
.	01530				JP SQRT+29D	01570	61000		01616	RADICAND 0
.	01531				RSH A*3	01571	02000		00003	DIVIDE BY 8 FOR LINEAR APPROX
.	01532				CDM A*W(SQRT+31D)*YMORE	01572	04730		0162C	SKIP IF BIT 24 0
.	01533				ADD A*W(SQRT+33D)*SKIP	01573	20130		01622	ADD 7/8
.	01534				15140 00000	01574	15140		00000	CP,A,SKIP
.	01535				ADD A*W(SQRT+34D)*SKIP	01575	20130		01623	ARG/8+7/8+ARG
.	01536				ADD A*W(SQRT+32D)*SKIP	01576	20130		01621	ADD 9/32
.	01537				RSH A*1*SKIP	01577	02100		00001	DIVIDE BY 2
.	01540				ADD A*W(SQRT+34D)	01600	20030		01623	ARG/8+9/32+ARG
.	01541				STR A*W(SQRT+35D)	01601	15030		01624	LINEAR APPROX COMPLETE
.	01542				ENT A*W(SQRT+34D)	01602	11030		01623	ENTER RADICAND (SCALED AT 28)
.	01543				RSH AQ*2	01603	03000		00002	SCALE AT 26
.	01544				DIV W(SQRT+35D)	01604	23030		01624	DIVIDE (SCALED AT 28)
.	01545				ADD Q*W(SQRT+35D)	01605	26030		01624	
.	01546				RSH Q*1	01606	01000		00001	
.	01547				STR Q*W(SQRT+35D)	01607	14030		01624	
.	01550				ENT A*W(SQRT+34D)	01610	11030		01623	ENTER RADICAND
.	01551				RSH AQ*2	01611	03000		00002	SCALE 2(ARG) AT 26
.	01552				DIV W(SQRT+35D)	01612	23030		01624	DIVIDE,RESULT IN Q
.	01553				ENT Y+Q*W(SQRT+35D)	01613	30030		01624	2(RESULT TO A
.	01554				RSH AQ*1+87*QPOS	01614	03207		00001	
.	01555				ADD A*1	01615	20000		00001	ROUND
.	01556				ENT 87*L(SQRT)	01616	12710		01561	EXIT ADDRESS TO B7
.	01557				JP 1+87	01617	61007		00001	RETURN
.	01560				01000 00000	01620	01000		00000	
.	01561				04400 00000	01621	04400		00000	9/32 AT 28
.	01562				16000 00000	01622	16000		00000	7/8 AT 28
.	01563				0 0	01623	00000		00000	TEMPORARY
.	01564				0 0	01624	00000		00000	TEMPORARYATAN
.	01565		ASIN		JP ASIN	01625	61000		01625	
.	01566				STR A*W(ASIN+27D)*APOS	01626	15630		01660	
.	01567				CP A*	01627	15040		00000	SET ARGUMENT POSITIVE
.	01570				COM Q*57D*YMORE	01630	04300		00071	
.	01571				ENT Q*57D	01631	10000		00071	
.	01572				ADD Q*2	01632	26000		00002	
.	01573				JP ASIN+22D*AZERO	01633	60400		01653	
.	01574				STR Q*L(ASIN+9D)*QPOS	01634	14210		01636	

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CAROS    L1 IO LABEL      TA STATEMENT                          LOC    F JKB Y      NOTES

   .     01575               JP   L(ASIN)                      01635  61010 01625
   .     01576               RSH  AQ*0*ANOT                    01636  03500 00000  CHECK FOR ARGUMENT GREATER OR
                                                                                     2
   .     01577               STR  Q*W(ASIN+280)*QPOS           01637  14230 01661
   .     01600               JP   L(ASIN)                      01640  61010 01625  ERROR RETURN
   .     01601               MUL  W(ASIN+280)                  01641  22030 01661
   .     01602               RSH  AQ*280                       01642  03000 00034
   .     01603               SU8  Q*0*QNOT                     01643  27500 00000
   .     01604               JP   $+16                         01644  61000 01662
   .     01605               ENT  Y-Q*W(ASIN+260)              01645  31030 01657
   .     01606               RJP  SQRT                         01646  65000 01561  COMPUTE SQRT(1-ARG SQUARED)

   .     01607               JP   L(ASIN)                      01647  61010 01625
   .     01610               ENT  Q*A                          01650  10070 00000  ARCSINEX ARCTAN(X/SQRT(1-XSQUA
                                                                                     RED))
   .     01611               ENT  A*W(ASIN+280)                01651  11030 01661
   .     01612               RJP  ATAN                         01652  65000 01664  COMPUTE ARCSINE (-X)
   .     01613               ENT  Q*W(ASIN+270)*QPOS           01653  10230 01660
   .     01614               CP   A*                           01654  15040 00000
   .     01615               ENT  87*L(ASIN)                   01655  12710 01625
   .     01616               JP   1+87                         01656  61007 00001  EXIT
   .     01617               20000      00000                  01657  20000 00000  1 AT 28
   .     01620               0    0                            01660  00000 00000  TEMPORARY
   .     01621               0    0                            01661  00000 00000  TEMPORARY
   .     01622               ENT  A*W(ASIN+260)                01662  11030 01657
   .     01623               JP   $-13                         01663  61000 01650
   .     01624 ATAN          JP   ATAN                         01664  61000 01664
   .     01625               STR  A*W(ATAN+620)*APOS           01665  15630 01762
   .     01626               CP   A*                           01666  15040 00000  SET POSITIVE
   .     01627               STR  Q*W(ATAN+630)*QPOS           01667  14230 01763
   .     01630               CP   Q*                           01670  14000 00000  SET POSITIVE
   .     01631               STR  A-Q*W(ATAN+640)              01671  33030 01764  FLAG BEARS SIGN ($Y$-$X$)
   .     01632               ENT  Y+Q*A                        01672  30070 00000  RESTORE A
   .     01633               COM  Q*A*YLESS                    01673  04270 00000  MIN ($Y$,$X$) TO A
   .     01634               LSH  AQ*300                       01674  07000 00036  INTERCHANGE A,Q
   .     01635               STR  Q*W(ATAN+650)                01675  14030 01765  DIVISOR Q MAX ($Y$,$Y$)
   .     01636               RSH  AQ*2                         01676  03000 00002  SCALE DIVIDEND AT 28
   .     01637               DIV  W(ATAN+650)*NOOF             01677  23230 01765  DIVISOR AT 0
   .     01640               JP   L(ATAN)                      01700  61010 01664
   .     01641               STR  Q*W(ATAN+650)                01701  14030 01765  QUOTIENT AT 28
   .     01642               SUB  A*A                          01702  21070 00000  CLEAR ACCUMULATOR
   .     01643               LSH  AQ*6*QPOS                    01703  07200 00006  ROUND TO NEAREST 16TH
   .     01644               ADD  A*1                          01704  20000 00001
   .     01645               ENT  87*A                         01705  12770 00000  LOAD INDEX REGISTER FOR TABLE
                                                                                     LOOKUP
   .     01646               STR  Q*W(ATAN+660)                01706  14030 01766  Y-YR AT 34
   .     01647               ENT  Q*A                          01707  10070 00000  YR AT 4
   .     01650               MUL  W(ATAN+650)                  01710  22030 01765  Y YR AT 4+28 32
   .     01651               ADD  A*4                          01711  20000 00004  4 1 AT 2 + 30 32
   .     01652               RSH  AQ*4                         01712  03000 00004  SCALE AT 1 + Y YR AT 28 IN Q

   .     01653               STR  Q*W(ATAN+650)                01713  14030 01765
   .     01654               ENT  A*W(ATAN+660)                01714  11030 01766  Y YR AT 34
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CARDS    L1 IO LABEL      TA STATEMENT                          LOC    F JKB Y      NOTES

    .    01655               RSH  AQ*80                       01715  03000 00010  SCALE DIVIDEND AT 34-8+30
    .    01656               OIV  W(ATAN+650)                 01716  23030 01765  (Y-Y)/(1+Y YR)
    .    01657               STR  Q*W(ATAN+65D)               01717  14030 01765  2 AT 28
    .    01660               MUL  W(ATAN+650)                 01720  22030 01765  Z 2 AT 56
    .    01661               OIV  W(ATAN+43D)                 01721  23030 01737  -3 AT 26,Q AT 56-26 30
    .    01662               MUL  W(ATAN+650)                 01722  22030 01765  -Z 3/3 AT 28
    .    01663               ADD  A*W(ATAN+650)               01723  20030 01765  Z - Z 3/3 AT 28
    .    01664               ADD  A*W(ATAN+450+B7)            01724  20037 01741  ADD TABLE ENTRY
    .    01665               ENT  Q*W(ATAN+640)*QNEG          01725  10330 01764  CHECK SIGN ($Y$,$X$)
    .    01666               SUB  A*W(ATAN+440)*SKIP          01726  21130 01740  COMPLEMENT ANGLE
    .    01667               CP   A*                          01727  15040 00000  SET NEGATIVE
    .    01670               RSH  A*1                         01730  02000 00001  RESULT AT 27
    .    01671               ENT  Q*W(ATAN+630)*QPOS          01731  10230 01763  SUPPLEMENT IF X NEGATIVE
    .    01672               ADD  A*W(ATAN+440)*SKIP          01732  20130 01740  PI/2 AT 28 PI AT 27
    .    01673               CP   A*                          01733  15040 00000  SET POSITIVE
    .    01674               ENT  Q*W(ATAN+620)*QPOS          01734  10230 01762  ACCORD PROPER SIGN
    .    01675               CP   A*                          01735  15040 00000
    .    01676               JP   L(ATAN)                     01736  61010 01664  EXIT
    .    01677               63774     42363                  01737  63774 42363  3.0016901 AT 26
    .    01700               31103     75524                  01740  31103 75524  PI/2 AT 28 PI AT 27
    .    01701               0    0                           01741  00000 00000  ARCTAN(00/16) AT 28
    .    01702               00777     25336                  01742  00777 25336  1
    .    01703               01772     55652                  01743  01772 55652  2
    .    01704               02756     27552                  01744  02756 27552  3
    .    01705               03726     67277                  01745  03726 67277  4
    .    01706               04661     16716                  01746  04661 16716  5
    .    01707               05573     03120                  01747  05573 03120  6
    .    01710               06462     35661                  01750  06462 35661  7
    .    01711               07326     14701                  01751  07326 14701  8
    .    01712               10145     37512                  01752  10145 37512  9
    .    01713               10740     02726                  01753  10740 02726  10
    .    01714               11505     74016                  01754  11505 74016  11
    .    01715               12227     43722                  01755  12227 43722  12
    .    01716               12725     42304                  01756  12725 42304  13
    .    01717               13400     51742                  01757  13400 51742  14
    .    01720               14031     64134                  01760  14031 64134  15
    .    01721               14441     76652                  01761  14441 76652  16
    .    01722               0    0                           01762  00000 00000  TEMPORARIES
    .    01723               0    0                           01763  00000 00000
    .    01724               0    0                           01764  00000 00000
    .    01725               0    0                           01765  00000 00000
    .    01726               0    0                           01766  00000 00000
    .    01727               RESERVE   1                      01767  00000 00000
                                                              01770  30100 00002
                                                              01771  52000 00002

END OF LISTING
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..... SPURT OUTPUT NO. 211 .....

COCON STYLOS*9/16/64

LABEL	LOC	LABEL	LOC	LABEL	LOC
A$$$$$1111	01770	A$$$$$1112	01771	AA	01256
ACQAZIM	63071	ACQELEV	63075	ACQUI	63427
ACTUALTIME	63142	AODSITE	01143	ADSCN	63416
AESCN	63417	ALLREAO	00417	ALPHAS	01200
AMDZERO	01067	ARDOT	01424	ASIN	01625
ASINERROR	00672	ASTRODEC	63106	ASTRORA	63105
ATAN	01664	AUCONVER	63332	AUPEREQUAT	63341
AZI	01243	AZIM	63053	AZIMOUT	64000
AZIMOVER	63325	AZIMAOO	63442	AZIMIN	75000
B28	01237	BEG	01160	BETOA1	01106
BLASTOFF	63146	BRDOT	01425	BUSTAPE	01372
BUSTAPEA	01374	COCON	63414	COCONX	00000
COEFRDOT	01207	COMPAZIM	00676	COMPELEV	00663
COMPST	00313	COMZRP	00631	CONTAOK	00436
CONTAOK1	00433	CONTFR	00373	CONVERTIME	63135
CORCT	63420	COS	01442	COSORIENT	63065
COSALPHAS	01201	COSAMD	01206	COSAZEL	63070
COSDELLAT	01271	COSDELS	01177	COSPHEE	01231
COSPHEMDEL	01270	CAPRE	01262	CAZIM	63060
CELBODY	63113	CELCOMPGM	63424	CELEV	63061
CELTIME	63133	CHCOR	63422	CHPAR	63431
CRANGE	63057	CRDOT	01426	DOPA	01211
DOPB	01212	OOPC	01213	DOPD	01214
DOPPOUT	66000	OOPPAOD	63444	DATANALYZE	63425
DAY	63150	DAYO	01155	DAYONE	01151
DAY1	01156	DAY2	01157	DAYNOMA	01415
DAYNUDIFF	01416	DE	01223	DEC	63003
DECDOT	63010	OEGRAO	01254	DELLAT	01257
DELTAS	01175	DELTATEE	63316	DERS	01171
DIFF	01154	DIFF1	01152	DIFF2	01153
DRAGDNDOT	01220	DSECONOS	63141	DUMSECTTG	63154
DYDMP	63421	ELEV	63054	ELEVOUT	65000
ELEVADD	63443	ELEVCON	01240	ELEVIN	76000
ENDINIT	00244	EQUAT	01431	EQUATOR	63323
ERTOAU	01264	ESTSHIFTED	63143	EX1	01173
EX1NEX2N	00746	EX1NEX2P	00754	EX1POS	00762
EX1PEX2N	00764	EX1PEX2P	00772	EX2	01174
EX2ZERO	01056	EXITA	00776	EXPNAME	63350
FOURPHEE	01435	FIRSTELEV	63104	FIRSTHRU	63153
FLATSQ	01260	FLATTENING	63337	FRACMASK	01161
FRAMESIZE	63101	FRBEG	01276	FREC	01275
FREND	01310	FREQUENCY	63317	FRINDIC	01422
FRMESS	01341	FRMESSA	01343	FRREAD	00273
FTTOAU	01265	FTTOER	01263	GEOCENLAT	63322
GEODETLAT	63321	GMTMOOU24	63145	GMTSHIFTED	63144
GREPOCH	00334	HOURANGLE	01076	HOURMINUTE	63137
HOURREG	63151	HALFREV	01244	HEI	01433
HEIGHT	63326	IO10RADIO	66777	ID11RADIO	67776
ID12RADIO	67777	ID13RADIO	70775	ID14RADIO	70776
ID15RADIO	71776	ID16RADIO	71777	ID17RADIO	72776
ID18RADIO	72777	IO19RADIO	73776	ID1CELCOR	63000

..... SPURT OUTPUT NO. 211 .....

CDCON STYLOS*9/16/64

LABEL	LOC	LABEL	LOC	LABEL	LOC
ID1ENTPNT	63410	IO1RADCOR	63050	ID1RADIO	63440
ID1RECRO	63210	IO1SYSENT	77576	ID1SYSNAM	77676
ID1SYSPAR	63310	IO1TIME	63130	ID20RADIO	73777
ID21RADIO	74776	IO22RADIO	74777	ID23RADIO	75776
ID24RADIO	75777	IO25RADIO	76775	ID26RADIO	76776
ID2CELCOR	63DD1	IO2ENTPNT	63411	ID2RADCOR	63051
ID2RADID	63441	IO2RECRO	63211	ID2SYSENT	77577
ID2SYSNAM	77677	IO2SYSPAR	63311	ID2TIME	63131
ID3RADID	63776	IO4RADIO	63777	IO5RADIO	64776
ID6RADIO	64777	IO7RADIO	65776	IO8RADIO	65777
ID9RADID	66776	INAZIMADD	63446	INBU	01414
INBUSTAPE	0141D	INELEVADD	63447	INFRMESS	01365
INIT	DDDD2	INREMESS	01360	INTER	63413
INTERAZIM	72DDD	INTERCOM	63426	INTERDOPP	74000
INTERELEV	730DD	INTERFR	01371	INTERP	01111
INTERRANGE	76777	INTERREW	01364	K1	01227
K1DOP	01215	K2	01226	K2OOP	01216
K2PHEE	D1436	K3	01225	K4PHEE	01437
K6PHEE	01440	KMPERNM	63342	KYBRDLEVEL	63110
LONGITUDE	63320	LAREC	01417	LREC	01420
LRECEND	D13D0	LSPERAU	63336	MAGEX2	01242
MAINSWITCH	63334	MCPFILLER	71000	MCPGM	63412
MINREG	63152	NOTONTAPE	00370	NOTTAPA	01314
NOTTAPE	01312	NEGRSP	00617	NEGRSP1	00621
NEGTIME	D1131	NINTYDEG	01241	NMPERAU	63340
PD	D1432	POLE	63324	PHEE	01251
PHEEMDEL	01266	PI	01245	PLANP	63434
PROCFREC	0D342	PRLOG	63423	QUARTREV	01246
RA	630D2	RACONAU	01236	RACONEARAD	01235
RADOT	63DD7	RADARMODE	63312	RADIOMETER	63102
RADIUS	630D6	RADIUSDOT	63011	RADRECIP	01423
RADTODEG	D1441	RANGE	63052	RANGEDUT	70777
RANGEADD	63445	RANGECON	01234	RANGEDOT	63062
RDMTR	63430	RDXXX	63433	RE	01224
READFR	D1274	READSTC	00245	READSTC1	00250
RECORDSIZE	63112	RECAZIM	67000	RECELEV	70000
RECFILE	63212	RECRD	63415	REGULAR	00465
REMESS	01323	REMESSA	01325	REQUAL1	01222
RERS	D1172	REVMASK	01203	REWAOK	00265
REWANS	01273	REWANS1	00255	REWERROR	00307
RS	01253	RSPRIME	01167	RSTAR	00625
RTEST	0D551	SATMSITE	01205	SAVE35	01272
SAZIM	63055	SCELTIME	63134	SDEC	63005
SECONDS	63140	SECINDAY	01217	SECINDIC	01421
SELEV	63D56	SETO	01142	SET270	01064
SET90	D1061	SETAZIMO	01051	SETAZIMP1	01053
SIDERTIME	63012	SIN	01453	SINDRIENT	63064
SINALPHAS	01165	SINAMD	01166	SINAZEL	63066
SINDELS	D1164	SINPHEE	01232	SINPHEMDEL	01267
SITEANGLE	D1075	SITEDRAG	01204	SITELONG	01163
SKIP	63331	SQRAD	01252	SQRT	01561

..... SPURT OUTPUT NO. 211 .....

COCON STYLOS*9/16/64

LABEL	LOC	LABEL	LOC	LABEL	LOC
SRA	63004	SRADTIME	63136	STATCK	00335
STCONST	00333	SYSENTRIES	77600	SYSNAMES	77700
SYSTAT1	63313	SYSTAT2	63314	SYSTATD	63315
TANPHEE	01255	TAPEBUST	00353	TAPESTAT	01311
TEMP	01221	TEMPA	01233	TEMPDOP	01210
TEMPLONG	01430	TEMPLAT	01427	THQUAREV	01250
THSIXTY	01162	TIMECORR	63107	TIMEMODE	63103
TIMEP	63435	TRIGFUNC	00467	TRIGFUNC1	00471
TRIGFUNC2	00474	TRIGFUNC3	00503	TRIGFUNC4	00505
TRIGFUNC5	00510	TRIGSCALF	01176	TRUERANGE	63063
TRUETIME	63132	TTYSTATUS	63111	TWOPI	01247
TWICEPHEE	01434	UNINBIT24	01261	VELOFLIGHT	63335
VIZOEC1	63014	VIZOEC2	63016	VIZRA1	63013
VIZRA2	63015	WON	01230	WFORD	63432
WFA00	63450	WFFREQ	63333	WNEREV	01202
WRITSTAT	01400	YEARMONTH	63147	YRTRAN	63327
ZRPRIME	01170	ZRTRAN	63330		

END OF LISTING

..... SPURT OUTPUT NO. 212 .....

COCON STYLOS* 9/16/64

LABEL	LOC	LABEL	LOC	LABEL	LOC
COCONX	00000	INIT	00002	ENDINIT	00244
READSTC	00245	READSTC1	00250	REWANS1	00255
REWAOK	00265	FRREAD	00273	REWERROR	00307
COMPST	00313	STCONST	00333	GREPOCH	00334
STATCK	00335	PROCFREC	00342	TAPEBUST	00353
NOTONTAPE	00370	CONTFR	00373	ALLREAD	00417
CONTAOK1	00433	CONTAOK	00436	REGULAR	00465
TRIGFUNC	00467	TRIGFUNC1	00471	TRIGFUNC2	00474
TRIGFUNC3	00503	TRIGFUNC4	00505	TRIGFUNC5	00510
RTEST	00551	NEGRSP	00617	NEGRSP1	00621
RSTAR	00625	COMZRP	00631	COMPELEV	00663
ASINERROR	00672	COMPAZIM	00676	EX1NEX2N	00746
EX1NEX2P	00754	EX1POS	00762	EX1PEX2N	00764
EX1PEX2P	00772	EXITA	00776	SETAZIMO	01051
SETAZIMPI	01053	EX2ZERO	01056	SET90	01061
SET270	01064	AMOZERO	01067	SITEANGLE	01075
HOURANGLE	01076	BETDA1	01106	INTERP	01111
NEGTIME	01131	SETD	01142	ADDSITE	01143
DAYONE	01151	DIFF1	01152	DIFF2	01153
DIFF	01154	DAYD	01155	DAY1	01156
DAY2	01157	BEG	01160	FRACMASK	01161
THSIXTY	01162	SITELONG	01163	SINOELS	01164
SINALPHAS	01165	SINAMO	01166	RSPRIME	01167
ZRPRIME	01170	DERS	01171	RERS	01172
EX1	01173	EX2	01174	DELTAS	01175
TRIGSCALF	01176	COSDELS	01177	ALPHAS	01200
COSALPHAS	01201	WNEREV	01202	REVMASK	01203
SITEDRAG	01204	SATMSITE	01205	COSAMO	01206
COEFROOT	01207	TEMPOOP	01210	OOPA	01211
OOPB	01212	OOPC	01213	OOPD	01214
K1ODP	01215	K2ODP	01216	SECINDAY	01217
DRAGONODT	01220	TEMP	01221	REQUAL1	01222
OE	01223	RE	01224	K3	01225
K2	01226	K1	01227	WON	01230
COSPHEE	01231	SINPHEE	01232	TEMPA	01233
RANGECON	01234	RACONEARAD	01235	RACONAU	01236
B2B	01237	ELEVCON	01240	NINTYDEG	01241
MAGEX2	01242	AZI	01243	HALFREV	01244
PI	01245	QUARTREV	01246	TWOPI	01247
THQUAREV	01250	PHEE	01251	SQRAD	01252
RS	01253	DEGRAD	01254	TANPHEE	01255
AA	01256	DELLAT	01257	FLATSQ	01260
UNINBIT24	01261	CAPRE	01262	FTTDER	01263
ERTDAU	01264	FTTDAU	01265	PHEEMDEL	01266
SINPHEMDEL	01267	COSPHEMDEL	01270	COSDELLAT	01271
SAVE35	01272	REWANS	01273	READFR	01274
FREC	01275	FRBEG	01276	LRECEND	01300
FREND	01310	TAPESTAT	01311	NOTTAPE	01312
NOTTAPA	01314	REMESS	01323	REMESSA	01325
FRMESS	01341	FRMESSA	01343	INREMESS	01360
INTERREW	01364	INFRMESS	01365	INTERFR	01371

..... SPURT OUTPUT NO. 212 .....

COCON STYLOS* 9/16/64

LABEL	LOC	LABEL	LOC	LABEL	LOC
BUSTAPE	01372	BUSTAPEA	01374	WRITSTAT	01400
INBUSTAPE	01410	INBU	01414	DAYNOMA	01415
OAYNUOIFF	01416	LAREC	01417	LREC	01420
SECINDIC	01421	FRINOIC	01422	RAORECIP	01423
AROOT	01424	BROOT	01425	CROOT	01426
TEMPLAT	01427	TEMPLONG	01430	EQUAT	01431
PO	01432	HEI	01433	TWICEPHEE	01434
FOURPHEE	01435	K2PHEE	01436	K4PHEE	01437
K6PHEE	01440	RAOTOOEG	01441	COS	01442
SIN	01453	SQRT	01561	ASIN	01625
ATAN	01664	A$$$$$1111	01770	A$$$$$1112	01771
IO1CELCOR	63000	ID2CELCOR	63001	RA	63002
OEC	63003	SRA	63004	SOEC	63005
RAOIUS	63006	RADOT	63007	OECODT	63010
RAOIUSDOT	63011	SIOERTIME	63012	VIZRA1	63013
VIZDEC1	63014	VIZRA2	63015	VIZOEC2	63016
IO1RADCOR	63050	ID2RAOCOR	63051	RANGE	63052
AZIM	63053	ELEV	63054	SAZIM	63055
SELEV	63056	CRANGE	63057	CAZIM	63060
CELEV	63061	RANGEOOT	63062	TRUERANGE	63063
SINORIENT	63064	COSORIENT	63065	SINAZEL	63066
COSAZEL	63070	ACQAZIM	63071	ACQELEV	63075
FRAMESIZE	631D1	RADIOMETER	63102	TIMEMDDE	63103
FIRSTELEV	63104	ASTRORA	63105	ASTROOEC	63106
TIMECORR	63107	KYBRDLEVEL	63110	TTYSTATUS	63111
RECORDSIZE	63112	CELBOOY	63113	IO1TIME	63130
IO2TIME	63131	TRUETIME	63132	CELTIME	63133
SCELTIME	63134	CONVERTIME	63135	SRADTIME	63136
HOURMINUTE	63137	SECONDS	63140	OSECONDS	63141
ACTUALTIME	63142	ESTSHIFTEO	63143	GMTSHIFTED	63144
GMTMODU24	63145	BLASTOFF	63146	YEARMONTH	63147
DAY	6315D	HOURREG	63151	MINREG	63152
FIRSTHRU	63153	OUMSECTTG	63154	IO1RECRO	63210
IO2RECRO	63211	RECFILE	63212	IO1SYSPAR	63310
IO2SYSPAR	63311	RADARMODE	63312	SYSTAT1	63313
SYSTAT2	63314	SYSTATO	63315	DELTATEE	63316
FREQUENCY	63317	LONGITUDE	63320	GEODETLAT	63321
GEOCENLAT	63322	EQUATOR	63323	POLE	63324
AZIMOVER	63325	HEIGHT	63326	YRTRAN	63327
ZRTRAN	6333D	SKIP	63331	AUCONVER	63332
WFFREQ	63333	MAINSWITCH	63334	VELOFLIGHT	63335
LSPERAU	63336	FLATTENING	63337	NMPERAU	63340
AUPEREQUAT	63341	KMPERNM	63342	EXPNAME	63350
IO1ENTPNT	6341D	IO2ENTPNT	63411	MCPGM	63412
INTER	63413	COCON	63414	RECRD	63415
ADSCN	63416	AESCN	63417	CORCT	63420
OYDMP	63421	CHCOR	63422	PRLOG	63423
CELCOMPGM	63424	OATANALYZE	63425	INTERCOM	63426
ACQUI	63427	ROMTR	63430	CHPAR	63431
WFORD	63432	RDXXX	63433	PLANP	63434
TIMEP	63435	ID1RADIO	63440	ID2RAOIO	63441

..... SPURT OUTPUT NO. 212 .....

COCON STYLOS*9/16/64

LABEL	LOC	LABEL	LOC	LABEL	LOC
AZIMADD	63442	ELEVADD	63443	OOPPADO	63444
RANGEADD	63445	INAZIMADO	63446	INELEVADD	63447
WFADO	6345D	IO3RADIO	63776	IO4RADIO	63777
AZIMOUT	6400D	IO5RADIO	64776	IO6RADIO	64777
ELEVOUT	65000	IO7RADIO	65776	IO8RADIO	65777
OOPPOUT	6600D	IO9RADIO	66776	IO10RADIO	66777
RECAZIM	67000	IO11RADIO	67776	IO12RADIO	67777
RECELEV	7DDOO	IO13RADIO	70775	IO14RADIO	70776
RANGEOUT	7D777	MCPFILLER	71000	IO15RADIO	71776
IO16RADID	71777	INTERAZIM	72000	IO17RADIO	72776
ID18RADIO	72777	INTERELEV	73000	IO19RADIO	73776
IO20RADID	73777	INTEROOPP	74000	IO21RADIO	74776
IO22RADIO	74777	AZIMIN	75000	IO23RADIO	75776
IO24RADIO	75777	ELEVIN	7609D	IO25RADIO	76775
IO26RADIO	76776	INTERRANGE	76777	IO1SYSENT	77576
IO2SYSENT	77577	SYSENTRIES	77600	IO1SYSNAM	77676
ID2SYSNAM	77677	SYSNAMES	77700		

END OF LISTING

CAROS	L1 IO	LABEL	TA	STATEMENT	LOC	F JKB Y	NOTES
.	0C000	RAOEC		PRUGRAM STYLOS*10/22/64			
.	0C001	RAOEC		U-TAG REGULAR*INIT	00000	00150 00002	
.	0C002			FO 1*RAOEC	00001	27061 11210	
.	0C003	INIT		JP INIT	00002	61000 00002	EXIT FROM INITIALIZATION
.	0C004			ENT Q*W(GEOOETLAT)	00003	10030 63321	B20 IN OEGREES
.	0C005			MUL W(OEGRAO)	00004	22030 00741	PROOUCT HAS B49
.	0C006			LSH AQ*7	00005	07000 00007	B56
.	0C007			STR A*W(PHEE)	00006	15030 00742	
.	00010			ENT Q*W(TSF)	00007	10030 00743	
.	0C011			RJP SIN	00010	65000 01266	
.	0C012			STR A*W(SINPHEE)	00011	15030 00744	B28
.	0C013			ENT A*W(PHEE)	00012	11030 00742	
.	0C014			ENT Q*W(TSF)	00013	10030 00743	
.	0C015			RJP COS	00014	65000 01255	
.	0C016			STR A*W(COSPHEE)	00015	15030 00745	
.	0C017			ENT Q*W(YRTRAN)	00016	10030 63327	
.	00020			MUL W(SINPHEE)	00017	22030 00744	B56
.	0C021			LSH AQ*1	00020	07000 00001	
.	0C022			STR A*W(K1)	00021	15030 00747	B28
.	0C023			ENT Q*W(ZRTRAN)	00022	10030 63330	
.	00024			MUL W(COSPHEE)	00023	22030 00745	B55
.	0C025			LSH AQ*2	00024	07000 00002	
.	0C026			AOO A*W(K1)	00025	20030 00747	
.	0C027			STR A*W(K1)	00026	15030 00747	B28
.	00030			ENT Q*W(ZRTRAN)	00027	10030 63330	
.	00031			MUL W(SINPHEE)	00030	22030 00744	B55
.	00032			LSH AQ*2	00031	07000 00002	
.	0C033			STR A*W(K2)	00032	15030 00750	
.	00034			ENT Q*W(YRTRAN)	00033	10030 63327	
.	00035			MUL W(COSPHEE)	00034	22030 00745	
.	0C036			LSH AQ*1	00035	07000 00001	
.	0C037			SUB A*W(K2)	00036	21030 00750	
.	00040			STR A*W(K2)	00037	15030 00750	B28
.	0C041			ENT Q*W(FRAMESIZE)	00040	10030 63101	
.	0C042			LSH Q*1	00041	05000 00001	
.	0C043			MUL W(WONSEC)	00042	22030 00732	
.	0C044			STR Q*W(FOURSEC)	00043	14030 00730	
.	0C045			RSH AQ*2	00044	03000 00002	
.	0C046			AOO Q*W(FOURSEC)	00045	26030 00730	
.	0C047			STR Q*W(THREESEC)	00046	14030 00731	
.	0C050			ENT A*LX(SYSTAT1)*APOS	00047	11650 63313	
.	0C051			JP RAOIN	00050	61000 00144	
.	0C052			RJP U(INTERCOM)	00051	65020 63426	
.	0C053			U-TAG WUTA*INA	00052	01031 01077	
.	00054			ENT B5*L(WHICHCLASS)	00053	12510 01026	
.	00055			JP $+B5	00054	61005 00054	
.	0C056			JP CELESTIAL	00055	61000 00067	
.	0C057			RJP U(INTERCOM)	00056	65020 63426	
.	0C060			U-TAG WUTB*INB	00057	01047 01103	
.	0C061			ENT B5*L(WHICHAE)	00060	12510 01027	
.	0C062			JP $+B5	00061	61005 00061	
.	0C063			JP RAOIN	00062	61000 00144	RAOAR INPUT
.	0C064			JP RAOOUT	00063	61000 0014C	RAOAR OUTPUT

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CAROS    L1 IO LABEL      TA STATEMENT                    LOC    F JKB Y      NOTES

   .     00065            JP   AZEL                      00064  61000 00111  AZ AND EL
   .     00066            JP   AZELWS                    00065  61000 00116  AZ AND EL WITH SCAN
   .     00067            JP   AZELCS                    00066  61000 00123  AZ AND EL CORRECTED FOR SITE
   .     00070 CELESTIAL  RJP  U(INTERCOM)               00067  65020 63426
   .     00071            U-TAG     WUTC*INC             00070  01067 01107
   .     00072            ENT  B5*L(WHICHRA)             00071  12510 01030
   .     00073            JP   $+B5                      00072  61005 00072
   .     00074            JP   RADEC1                    00073  61000 00101
   .     00075 RADECWSC   ENT  A*W(SELSRA)               00074  11030 00751  RA AND DEC WITH SCAN
   .     00076            STR  A*W(ENTRA)                00075  15030 00165
   .     00077            ENT  A*W(SELSDEC)              00076  11030 00752
   .     00100            STR  A*W(ENTDEC)               00077  15030 00167
   .     00101            JP   $+5                       00100  61000 00105
   .     00102 RADEC1     ENT  A*W(SELRA)                00101  11030 00753
   .     00103            STR  A*W(ENTRA)                00102  15030 00165
   .     00104            ENT  A*W(SELDEC)               00103  11030 00754
   .     00105            STR  A*W(ENTDEC)               00104  15030 00167
   .     00106            ENT  A*W(JPRADE)               00105  11030 00755  SET SWITCH IN WORKING PROGRAM

   .     00107            STR  A*W(MAINSWIT)             00106  15030 00163
   .     00110            CL   W(COMRASITE)              00107  16030 00733
   .     00111            JP   L(INIT)                   00110  61010 00002  EXIT FROM INITIALIZATION
   .     00112 AZEL       ENT  A*W(SELAZ)                00111  11030 00756
   .     00113            STR  A*W(ENTAZ)                00112  15030 00173
   .     00114            ENT  A*W(SELEL)                00113  11030 00757
   .     00115            STR  A*W(ENTEL)                00114  15030 00202
   .     00116            JP   INITENO                   00115  61000 00135
   .     00117 AZELWS     ENT  A*W(SELAZWS)              00116  11030 00760
   .     00120            STR  A*W(ENTAZ)                00117  15030 00173
   .     00121            ENT  A*W(SELELWS)              00120  11030 00761
   .     00122            STR  A*W(ENTEL)                00121  15030 00202
   .     00123            JP   INITENO                   00122  61000 00135
   .     00124 AZELCS     ENT  A*W(SELAZCS)              00123  11030 00762
   .     00125            STR  A*W(ENTAZ)                00124  15030 00173
   .     00126            ENT  A*W(SELELCS)              00125  11030 00763
   .     00127            STR  A*W(ENTEL)                00126  15030 00202
   .     00130            ENT  A*W(SELRANC)              00127  11030 00764
   .     00131            STR  A*W(ENTRANGE)             00130  15030 00211
   .     00132            ENT  A*W(JPAZEL)               00131  11030 00765
   .     00133            STR  A*W(MAINSWIT)             00132  15030 00163
   .     00134            CL   W(COMRASITE)              00133  16030 00733
   .     00135            JP   L(INIT)                   00134  61010 00002
   .     00136 INITEND    ENT  A*W(SELRAN)               00135  11030 00766
   .     00137            STR  A*W(ENTRANGE)             00136  15030 00211
   .     00140            JP   $-6                       00137  61000 00131
   .     00141 RADOUT     ENT  A*W(SETAE)                00140  11030 00767
   .     00142            STR  A*W(MAINSWIT)             00141  15030 00163
   .     00143            STR  A*W(COMRASITE)            00142  15030 00733
   .     00144            JP   L(INIT)                   00143  61010 00002
   .     00145 RADIN      ENT  A*W(SETAEIN)              00144  11030 00770
   .     00146            STR  A*W(MAINSWIT)             00145  15030 00163
   .     00147            STR  A*W(COMRASITE)            00146  15030 00733
   .     00150            JP   L(INIT)                   00147  61010 00002
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CARDS    L1 ID LABEL      TA STATEMENT                          LOC    F JKB Y      NOTES

   .     OC151 REGULAR       JP   REGULAR                      00150  61000 0015C
   .     OC152               ENT  A*W(SIDERTIME)               00151  11030 63012
   .     00153               STR  A*W(SITEDRAGON)              00152  15030 00737
   .     00154               RJP  WORKING                      00153  65000 00161
   .     00155               ENT  A*W(TIMEMODE)*APOS           00154  11630 63103
   .     00156               JP   L(REGULAR)                   00155  61010 00150
   .     00157               ENT  A*W(TIMEINTER)               00156  11030 00726
   .     OC160               STR  A*W(CLOCKINTER)              00157  15030 00027
   .     OC161               JP   L(REGULAR)                   00160  61010 0015C
   .     00162 WORKING       JP   WORKING                      00161  61000 00161
   .     00163               RIL                               00162  60000 00000
   .     00164 MAINSWIT      JP   $                            00163  61000 00163  THIS SWITCH SET BY INITIALIZAT
                                                                                     ION
   .     OC165 RADE          NO-OP                             00164  12000 00000  DISPLAY IS RIGHT ASCENSION
   .     00166 ENTRA         NO-OP                             00165  12000 0000C  SET B INI TO GET RA OR $RA
   .     00167               STR  A*W(RAOUT)                   00166  15030 00771  IN REVOLUTIONS WITH $27
   .     OC170 ENTDEC        NO-OP                             00167  12000 0000C  SET BY INIT TO GET OEC OR SDEC

   .     OC171               STR  A*W(DECOUT)                  00170  15030 00772
   .     00172               JP   CONVRADEC                    00171  61000 00532
   .     OC173 AER           NO-OP                             00172  12000 00000  DISPLAY SOME AZ,EL,AND RANGE
   .     OC174 ENTAZ         NO-OP                             00173  12000 00000  SET BY INIT TO ENTER OESIRED A
                                                                                     ZIM
   .     00175               AOD  Q*W(WNEREV)                  00174  26030 00773
   .     00176               ENT  LP*W(REVMASK)                00175  40030 00774
   .     OC177               ENT  Q*A                          00176  10070 00000
   .     00200               MUL  W(THSIXTY)                   00177  22030 00775
   .     00201               LSH  AQ*3                         00200  07000 00003
   .     OC202               STR  A*W(AZ)                      00201  15030 00776  AZIMUTH IN RADIANS B26
   .     OC203 ENTEL         NO-OP                             00202  12000 00000  SET BY INIT TO ENTER DESIRED E
                                                                                     LEV
   .     00204               AOD  Q*W(WNEREV)                  00203  26030 00773
   .     OC205               ENT  LP*W(REVMASK)                00204  40030 00774
   .     00206               ENT  Q*A                          00205  10070 00000
   .     00207               MUL  W(THSIXTY)                   00206  22030 00775
   .     00210               LSH  AQ*3                         00207  07000 00003
   .     OC211               STR  A*W(EL)                      00210  15030 00777
   .     00212 ENTRANGE      NO-OP                             00211  12000 00000  SET BY INIT TO ENTER DESIREO R
                                                                                     ANGE
   .     00213               JP   SETBIGKO                     00212  61000 00234  RANGE IS INFINITE
   .     OC214               STR  A*W(TARRANGE)                00213  15030 01000
   .     OC215 OETRAANDD     ENT  A*W(TARRANGE)*ANOT           00214  11530 01000
   .     00216               JP   SETBIGKO                     00215  61000 00234
   .     00217               ENT  A*W(TARRANGE)*APOS           00216  11630 0100C
   .     OC220               CP   A*                           00217  15040 0000C
   .     00221               STR  A*W(TEMP)                    00220  15030 01001  B22 ER OR B24 AU
   .     00222               CL   Q*                           00221  10000 0000C
   .     OC223               ENT  A*W(K1)                      00222  11030 00747
   .     OC224               RSH  AQ*9D                        00223  03000 00011
   .     OC225               DIV  W(TEMP)                      00224  23030 01001  QUOTIENT HAS B26
   .     00226               STR  Q*W(K11)                     00225  14030 01014
   .     UC227               ENT  A*W(K2)                      00226  11030 0075C
   .     OC230               CL   Q*                           00227  10000 0000C
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CAROS	L1 IO	LABEL	TA	STATEMENT	LOC	F	JKB	Y	NOTES
.	00231		RSH	AQ*90	00230	03000	00011		
.	00232		DIV	W(TEMP)	00231	23030	01001		
.	00233		STR	Q*W(K21)	00232	14030	01015		
.	00234		JP	$+3	00233	61000	00236		
.	00235	SETBIGKO	CL	W(K11)	00234	16030	01014		
.	00236		CL	W(K21)	00235	16030	01015		
.	00237		ENT	A*W(AZ)	00236	11030	00776		FIND TRIGFUNCTIONS
.	00240		ENT	Q*W(TSF)	00237	10030	00743		
.	00241		RJP	COS	00240	65000	01255		
.	00242		STR	A*W(COSAZ)	00241	15030	01003		
.	00243		ENT	A*W(AZ)	00242	11030	00776		
.	00244		ENT	Q*W(TSF)	00243	10030	00743		
.	00245		RJP	SIN	00244	65000	01266		
.	00246		STR	A*W(SINAZ)	00245	15030	01002		
.	00247		ENT	A*W(EL)	00246	11030	00777		
.	00250		ENT	Q*W(TSF)	00247	10030	00743		
.	00251		RJP	COS	00250	65000	01255		
.	00252		STR	A*W(COSEL)	00251	15030	01005		
.	00253		ENT	A*W(EL)	00252	11030	00777		
.	00254		ENT	Q*W(TSF)	00253	10030	00743		
.	00255		RJP	SIN	00254	65000	01266		
.	00256		STR	A*W(SINEL)	00255	15030	01004		
.	00257		ENT	A*W(SITEORAGON)	00256	11030	00737		
.	00260		ENT	Q*W(TSF)	00257	10030	00743		
.	00261		RJP	COS	00260	65000	01255		
.	00262		STR	A*W(COSORAGON)	00261	15030	01007		
.	00263		ENT	A*W(SITEORAGON)	00262	11030	00737		
.	00264		ENT	Q*W(TSF)	00263	10030	00743		
.	00265		RJP	SIN	00264	65000	01266		
.	00266		STR	A*W(SINORAGON)	00265	15030	01006		
.	00267		ENT	Q*W(COSEL)	00266	10030	01005	B28	
.	00270		MUL	W(COSAZ)	00267	22030	01003	B56	
.	00271		LSH	AQ*330	00270	07000	00041	B29	
.	00272		MUL	W(SINPHEE)	00271	22030	00744	B57	
.	00273		LSH	AQ*1	00272	07000	00001	B58	
.	00274		STR	A*W(TEMP)	00273	15030	01001		
.	00275		ENT	Q*W(SINEL)	00274	10030	01004	B28	
.	00276		MUL	W(COSPHEE)	00275	22030	00745	B56	
.	00277		LSH	AQ*2	00276	07000	00002	B58	
.	00300		SUB	A*W(TEMP)	00277	21030	01001		
.	00301		ADD	A*W(K11)	00300	20030	01014		
.	00302		STR	A*W(FACT1)	00301	15030	01010	B28	
.	00303		LSH	AQ*300	00302	07000	00036		
.	00304		MUL	W(COSORAGON)	00303	22030	01007		
.	00305		LSH	AQ*1	00304	07000	00001		
.	00306		STR	A*W(TEMP)	00305	15030	01001	B27	
.	00307		ENT	Q*W(COSEL)	00306	10030	01005		
.	00310		MUL	W(SINAZ)	00307	22030	01002	B56	
.	00311		LSH	AQ*320	00310	07000	00040		
.	00312		STR	Q*W(FACT2)	00311	14030	01011	B28	
.	00313		MUL	W(SINORAGON)	00312	22030	01006		
.	00314		LSH	AQ*1	00313	07000	00001		
.	00315		CP	A*	00314	15040	00000		

CAROS	L1 IO LABEL	TA	STATEMENT	LOC	F JKB Y	NOTES
.	00316		AOO A*W(TEMP)	00315	20030 01001	
.	00317		STR A*W(XSPRIME)	00316	15030 01012	B27
.	00320		ENT Q*W(FACT2)	00317	10030 01011	
.	00321		MUL W(COSORAGON)	00320	22030 01007	
.	00322		LSH AQ*1	00321	07000 00001	
.	00323		STR A*W(TEMP)	00322	15030 01001	
.	00324		ENT Q*W(FACT1)	00323	10030 01010	
.	00325		MUL W(SINORAGON)	00324	22030 01006	
.	00326		LSH AQ*1	00325	07000 00001	
.	00327		AOO A*W(TEMP)	00326	20030 01001	B58
.	00330		STR A*W(YSPRIME)	00327	15030 01013	B27
.	00331		ENT Q*W(SINEL)	00330	10030 01004	
.	00332		MUL W(SINPHEE)	00331	22030 00744	B56
.	00333		LSH AQ*1	00332	07000 00001	
.	00334		STR A*W(TEMP)	00333	15030 01001	B27
.	00335		ENT Q*W(COSEL)	00334	10030 01005	
.	00336		MUL W(COSAZ)	00335	22030 01003	B56
.	00337		LSH AQ*320	00336	07000 00040	B28
.	00340		MUL W(COSPHEE)	00337	22030 00745	B56
.	00341		LSH AQ*1	00340	07000 00001	B57
.	00342		AOO A*W(TEMP)	00341	20030 01001	
.	00343		STR A*W(ZSPRIME)	00342	15030 01016	
.	00344		ENT A*W(K21)	00343	11030 01015	
.	00345		RSH AQ*1	00344	03000 00001	
.	00346		CP A*	00345	15040 00000	
.	00347		AOO A*W(ZSPRIME)	00346	20030 01016	
.	00350		STR A*W(ZSPRIME)	00347	15030 01016	
.	00351		ENT Q*W(XSPRIME)	00350	10030 01012	
.	00352		MUL W(XSPRIME)	00351	22030 01012	B56
.	00353		STR A*W(TEMP)	00352	15030 01001	
.	00354		ENT Q*W(YSPRIME)	00353	10030 01013	
.	00355		MUL W(YSPRIME)	00354	22030 01013	
.	00356		AOO A*W(TEMP)	00355	20030 01001	
.	00357		ENT Q*W(SCALEB24)	00356	10030 00746	
.	00360		RJP SQRT	00357	65000 01374	
.	00361		JP $	00360	61000 00360	
.	00362		LSH AQ*310	00361	07000 00037	
.	00363		ENT A*W(ZSPRIME)	00362	11030 01016	
.	00364		RJP ATAN	00363	65000 01152	
.	00365		LSH AQ*300	00364	07000 00036	
.	00366		MUL W(RAOTOREV)	00365	22030 01022	
.	00367		LSH AQ*1	00366	07000 00001	
.	00370		STR A*W(OECOUT)	00367	15030 00772	DECLINATION IN REV B27
.	00371		ENT A*W(YSPRIME)	00370	11030 01013	
.	00372		ENT Q*W(XSPRIME)	00371	10030 01012	
.	00373		RJP ATAN	00372	65000 01152	
.	00374		RSH AQ*1*APOS	00373	03600 00001	
.	00375		AOO A*W(THSIXTY)	00374	20030 00775	
.	00376		LSH AQ*300	00375	07000 00036	
.	00377		MUL W(RAOTOREV)	00376	22030 01022	
.	00400		LSH AQ*2	00377	07000 00002	
.	00401		STR A*W(RAOUT)	00400	15030 00771	
.	00402		JP CONVRAOEC	00401	61000 00532	

CAROS	L1 IO	LABEL	TA	STATEMENT	LOC	F JKB Y	NOTES
.	00403	AEOUT	ENT	B6*L(AZOUTBUF)	00402	12610 00133	OUTPUT BUFFER REG
.	00404		ENT	Q*W(0+B6)	00403	10036 00000	
.	00405		ENT	LP*W(SAVE19BITS)	00404	40030 01025	AZ B19
.	00406		LSH	AQ*38D	00405	07000 00046	B27
.	00407		MUL	W(THSIXTY)	00406	22030 00775	
.	00410		LSH	AQ*3	00407	07000 00003	
.	00411		STR	A*W(AZ)	00410	15030 00776	B26 IN RAOIAUS
.	00412		ENT	B6*L(ELOUTBUF)	00411	12610 00132	
.	00413		ENT	Q*W(0+B6)	00412	10036 00000	
.	00414		ENT	LP*W(SAVE19BITS)	00413	40030 01025	ELEV B19
.	00415		LSH	AQ*38D	00414	07000 00046	B27 IN REVS
.	00416		MUL	W(THSIXTY)	00415	22030 00775	
.	00417		LSH	AQ*3	00416	07000 00003	
.	00420		STR	A*W(EL)	00417	15030 00777	B26 IN RADIANS
.	00421		CL	W(TARRANGE)	00420	16030 01000	
.	00422		JP	COMPSITE0	00421	61000 00525	
.	00423	AEIN1	ENT	A*L(INAZIMADO)	00422	11010 63446	
.	00424		ADD	A*4990	00423	20000 00763	
.	00425		ENT	B6*A	00424	12670 00000	
.	00426		ENT	Q*W(0+B6)	00425	10036 00000	
.	00427		ENT	LP*W(SAVE19BITS)	00426	40030 01025	
.	00430		CL	Q*	00427	10000 00000	
.	00431		LSH	AQ*38D	00430	07000 00046	
.	00432		MUL	W(THSIXTY)	00431	22030 00775	
.	00433		LSH	AQ*3	00432	07000 00003	
.	00434		STR	A*W(AZ)	00433	15030 00776	
.	00435		ENT	A*L(INELEVADO)	00434	11010 63447	
.	00436		ADD	A*4990	00435	20000 00763	
.	00437		ENT	B6*A	00436	12670 00000	
.	00440		ENT	Q*W(0+B6)	00437	10036 00000	
.	00441		ENT	LP*W(SAVE19BITS)	00440	40030 01025	
.	00442		CL	Q*	00441	10000 00000	
.	00443		LSH	AQ*38D	00442	07000 00046	
.	00444		MUL	W(THSIXTY)	00443	22030 00775	
.	00445		LSH	AQ*3	00444	07000 00003	
.	00446		STR	A*W(EL)	00445	15030 00777	
.	00447		JP	COMPSITE0-1	00446	61000 00524	
.	00450	AEIN2	ENT	A*U(INAZIMADO)	00447	11020 63446	
.	00451		ADD	A*499D	00450	20000 00763	
.	00452		ENT	B6*A	00451	12670 00000	
.	00453		ENT	Q*W(U+B6)	00452	10036 00000	
.	00454		ENT	LP*W(SAVE19BITS)	00453	40030 01025	
.	00455		CL	Q*	00454	10000 00000	
.	00456		LSH	AQ*38D	00455	07000 00046	
.	00457		MUL	W(THSIXTY)	00456	22030 00775	
.	00460		LSH	AQ*3	00457	07000 00003	
.	00461		STR	A*W(AZ)	00460	15030 00776	
.	00462		ENT	A*U(INELEVADO)	00461	11020 63447	
.	00463		ADD	A*4990	00462	20000 00763	
.	00464		ENT	B6*A	00463	12670 00000	
.	00465		ENT	Q*W(0+B6)	00464	10036 00000	
.	00466		ENT	LP*W(SAVE19BITS)	00465	40030 01025	
.	00467		CL	Q*	00466	10000 00000	

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CARDS    L1 IO LABEL      TA STATEMENT                          LOC    F JKB Y      NOTES
   .     0C470                LSH  AQ*380                       00467  07000 00046
   .     0C471                MUL  W(THSIXTY)                   00470  22030 00775
   .     0C472                LSH  AQ*3                         00471  07000 00003
   .     0D473                STR  A*W(EL)                      00472  15030 00777
   .     00474                JP   COMPSITE0-1                  00473  61000 00524
   .     0C475 AEIN           ENT  A*L(AZINBUF)                 00474  11010 00113
   .     0C476                SUB  A*U(INAZIMA00)*ANOT          00475  21520 63446
   .     0C477                JP   AEIN1                        00476  61000 00422  USE LOWER HALF
   .     0C500                ENT  A*L(AZINBUF)                 00477  11010 00113
   .     0C501                SUB  A*L(INAZIMA00)*ANOT          00500  21510 63446
   .     0C502                JP   AEIN2                        00501  61000 00447  USE UPPER HALF
   .     0C503                ENT  B6*L(AZINBUF)                00502  12610 00113
   .     0D504                BJP  B6*$+1                       00503  72600 00504
   .     0C505                ENT  Q*W(0+B6)                    00504  10036 00000
   .     0C506                ENT  LP*W(SAVE19BITS)             00505  40030 01025
   .     0C507                CL   Q*                           00506  10000 00000
   .     0C510                LSH  AQ*380                       00507  07000 00046
   .     0C511                MUL  W(THSIXTY)                   00510  22030 00775
   .     0C512                LSH  AQ*3                         00511  07000 00003
   .     0C513                STR  A*W(AZ)                      00512  15030 00776  B26 IN RADIANS
   .     UC514                ENT  B6*L(ELINBUF)                00513  12610 00112
   .     0C515                BJP  B6*$+1                       00514  72600 00515
   .     0C516                ENT  Q*W(0+B6)                    00515  10036 00000
   .     0D517                ENT  LP*W(SAVE19BITS)             00516  40030 01025
   .     0D520                CL   Q*                           00517  10000 00000
   .     0C521                LSH  AQ*380                       00520  07000 00046
   .     00522                MUL  W(THSIXTY)                   00521  22030 00775
   .     UD523                LSH  AQ*3                         00522  07000 00003
   .     0D524                STR  A*W(EL)                      00523  15030 00777  B26 IN RADIAUS
   .     0D525                CL   W(TARRANGE)                  00524  16030 01000
   .     0D526 CUMPSITED      ENT  A*W(SIDERTIME)               00525  11030 63012
   .     0D527                SUB  A*W(DIFFSEC)*APOS            00526  21630 00727
   .     0C530                ADD  A*W(THSIXTY)                 00527  20030 00775
   .     0C531                STR  A*W(SITEORAGON)              00530  15030 00737
   .     0D532                JP   OETRAANOD                    00531  61000 00214
   .     0D533 CONVRADEC      ENT  A*W(02483)                   00532  11030 00656
   .     0D534                STR  A*W(OUM1)                    00533  15030 00657
   .     0D535                ENT  Q*W(RAOUT)                   00534  10030 00771
   .     0D536                AOD  Q*W(SEVSECREV)               00535  26030 00662
   .     0D537                RJP  CONRA                        00536  65000 00615
   .     0C540                ENT  A*W(RAIMAGE)                 00537  11030 00724
   .     0C541                CL   B6*                          00540  12600 00000
   .     0C542                LSH  A*4                          00541  C6000 00004
   .     0D543                AOD  A*W(RAH+B6)                  00542  20036 00713
   .     0C544                BSK  B6*5                         00543  71600 00005
   .     0C545                JP   $-3                          00544  61000 00541
   .     UC546                STR  A*W(RAOUTA)                  00545  15030 0071C
   .     0C547                STR  A*W(ASTRORA)                 00546  15030 63105
   .     0C550                EX-FCT    DATACHA*W(RAOUTA)       00547  13270 0071C
   .     0C551                ENT  Q*W(SITEORAGON)              00550  10030 00737
   .     0C552                MUL  W(RADTOREV)                  00551  22030 01022
   .     UC553                LSH  AQ*2                         00552  07000 00002
   .     UC554                SUB  A*W(RAOUT)*APOS              00553  21630 00771
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CAROS	L1 IO	LABEL	TA	STATEMENT	LOC	F JKB Y	NOTES
.	00555			ADO A*W(WNEREV)	00554	20030 00773	
.	00556			LSH AQ*300	00555	07000 00036	
.	00557			ADO Q*W(SEVSECREV)	00556	26030 00662	
.	00560			RJP CONRA	00557	65000 00615	
.	00561			ENT A*W(LHAIMAGE)	00560	11030 01020	
.	00562			CL B6*	00561	12600 00000	
.	00563			LSH AQ*4	00562	07000 00004	
.	00564			ADO A*W(RAH+B6)	00563	20036 00713	
.	00565			BSK B6*5	00564	71600 00005	
.	00566			JP $-3	00565	61000 00562	
.	00567			STR A*W(LHAOUT)	00566	15030 01021	
.	00570			EX-FCT OATACHA*W(LHAOUT)	00567	13270 01021	
.	00571			ENT Q*W(OECOUT)*QPOS	00570	10230 00772	
.	00572			CP Q*	00571	14000 00000	
.	00573			ADO Q*W(HALFSECREV)	00572	26030 00661	
.	00574			ENT A*W(036083)	00573	11030 00660	
.	00575			STR A*W(OUM1)	00574	15030 00657	
.	00576			RJP CONRA	00575	65000 00615	
.	00577			ENT A*W(OECIMAGE)	00576	11030 00725	
.	00600			ENT Q*W(OECOUT)*QNEG	00577	10330 00772	
.	00601			JP $+2	00600	61000 00602	
.	00602			ADO A*W(OECNEG)	00601	20030 00663	
.	00603			CL B6*	00602	12600 00000	
.	00604			LSH A*4	00603	06000 00004	
.	00605			ADO A*W(RAH+B6)	00604	20036 00713	
.	00606			BSK B6*5	00605	71600 00005	
.	00607			JP $-3	00606	61000 00603	
.	00610			STR A*W(OECOUTA)	00607	15030 00711	
.	00611			STR A*W(ASTROOEC)	00610	15030 63106	
.	00612			EX-FCT OATACHA*W(OECOUTA)	00611	13270 00711	
.	00613			ENT A*W(FOURSEC)	00612	11030 00730	
.	00614			STR A*W(DIFFSEC)	00613	15030 00727	
.	00615			RILJP L(WORKING)	00614	60110 00161	
.	00616	CONRA		ENTRY	00615	61000 00000	
.	00617			MUL W(OUM1)	00616	22030 00657	
.	00620			STR A*W(HHH)	00617	15030 00664	
.	00621			CL A*	00620	11000 00000	
.	00622			RSH AQ*1	00621	03000 00001	
.	00623			MUL W(060B1)	00622	22030 00665	
.	00624			STR A*W(MMM)	00623	15030 00666	
.	00625			CL A*	00624	11000 00000	
.	00626			RSH AQ*1	00625	03000 00001	
.	00627			MUL W(060B1)	00626	22030 00665	
.	00630			STR A*W(SSS)	00627	15030 00667	
.	00631			CL A*	00630	11000 00000	
.	00632			ENT Q*W(HHH)	00631	10030 00664	
.	00633			DIV 100	00632	23000 00012	
.	00634			STR A*W(RAH+1)	00633	15030 00714	
.	00635			CL A*	00634	11000 00000	
.	00636			DIV 100	00635	23000 00012	
.	00637			STR A*W(RAH)	00636	15030 00713	
.	00640			ENT Q*W(MMM)	00637	10030 00666	
.	00641			CL A*	00640	11000 00000	

CAROS	L1	IO	LABEL	TA	STATEMENT	LOC	F	JKB	Y	NOTES
.	00642				OIV 100	00641	23000	00012		
.	00643				STR A*W(RAH+3)	00642	15030	00716		
.	00644				CL A	00643	11000	00000		
.	00645				OIV 100	00644	23000	00012		
.	00646				STR A*W(RAH+2)	00645	15030	00715		
.	00647				CL A*	00646	11000	00000		
.	00650				ENT Q*W(SSS)	00647	10030	00667		
.	00651				OIV 100	00650	23000	00012		
.	00652				STR A*W(RAH+5)	00651	15030	00720		
.	00653				CL A*	00652	11000	00000		
.	00654				OIV 100	00653	23000	00012		
.	00655				STR A*W(RAH+4)	00654	15030	00717		
.	00656				EXIT	00655	61010	00615		
.	00657	02483			0000000300	00656	00000	00300	DEC	24.83
.	00660		OUM1		0	00657	00000	00000		
.	00661	03608 3			0000005500	00660	00000	05500	DEC	360.83
.	00662		HALFSECREV		00000 00063	00661	00000	00063		
.	00663		SEVSECREV		00000 01227	00662	00000	01227		
.	00664		OECNEG		0 1	00663	00000	00001		
.	00665		HHH		0	00664	00000	0000C		
.	00666		06081		0000000170	00665	00000	00170	DEC	60.81
.	00667		MMM		0	00666	00000	00000		
.	00670		SSS		0	00667	00000	00000		
.	00671		RAOECINT		JP RAOECINT	00670	61000	00670		
.	00672				STR A*W(SAVEA)	00671	15030	00734		
.	00673				STR Q*W(SAVEQ)	00672	14030	00735		
.	00674				STR B6*W(SAVEB6)	00673	16630	00736		
.	00675				ENT A*W(RILX)	00674	11030	0074C		
.	00676				STR A*W(CLOCKINTER)	00675	15030	00027		
.	00677				ENT A*W(COMRASITE)*ANOT	00676	11530	00733		
.	00700				JP NOGO	00677	61000	00703		
.	00701				ENT A*W(THREESEC)	00700	11030	00731		
.	00702				STR A*W(DIFFSEC)	00701	15030	00727		
.	00703				RJP WORKING	00702	65000	00161		
.	00704		NOGO		ENT A*W(SAVEA)	00703	11030	00734		
.	00705				ENT Q*W(SAVEQ)	00704	10030	00735		
.	00706				ENT B6*W(SAVEB6)	00705	12630	00736		
.	00707				RILJP L(RAOECINT)	00706	60110	00670		
.	00710		OPLAY		U-TAG OECOUTA*RAOUTA	00707	00711	00710		
.	00711		RAOUTA		0 0	00710	00000	0000C		
.	00712		OECOUTA		0 0	00711	00000	0000C		
.	00713		REVTOOEG		2640000000	00712	26400	00000	OEC	360.0820
.	00714		RAH		0 0	00713	00000	00000		
.	00715				0 0	00714	00000	00000		
.	00716				0 0	00715	00000	00000		
.	00717				0 0	00716	00000	0000C		
.	00720				0 0	00717	00000	00000		
.	00721				0 0	00720	00000	00000		
.	00722				0 0	00721	00000	00000		

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CAROS    L1 IO LABEL       TA STATEMENT                          LOC    F JKB Y      NOTES

.        00723 INTERG          0     0                           00722  00000 00000
.        00724 FRACTION        0     0                           00723  00000 00000
.        00725 RAIMAGE         0     00010                       00724  00000 00010
.        00726 OECIMAGE        0     00014                       00725  00000 00014
.        00727 TIMEINTER       RJP   RAOECINT                    00726  65000 00670
.        00730 DIFFSEC         0     46100                       00727  00000 46100
.        00731 FOURSEC         0     46100                       00730  00000 46100
.        00732 THREESEC        0     57520                       00731  00000 57520
.        00733 WONSEC          0     11420                       00732  00000 11420  B26 IN RAOIANS
.        00734 CLOCKINTER      EQUALS      00027
.        00735 COMRASITE       0     0                           00733  00000 00000
.        00736 SAVEA           0     0                           00734  00000 00000
.        00737 SAVEQ           0     0                           00735  00000 00000
.        00740 SAVEB6          0     0                           00736  00000 00000
.        00741 DATACHA         MEANS       C5
.        00742 SITEORAGON      0     0                           00737  00000 00000
.        00743 RILX            RIL                               00740  60000 00000
.        00744 OEGRAD          0043575063                        00741  00435 75063  OEC        .01745329B29

.        00745 PHEE            0     0                           00742  00000 00000  B26 IN RADIANS
.        00746 TSF             0     260                         00743  00000 00032  TRIG SCALE FACTOR
.        00747 SINPHEE         0     0                           00744  00000 00000  B28
.        00750 COSPHEE         0     0                           00745  00000 00000  B28
.        00751 SCALEB24        0     240                         00746  00000 00030
.        00752 K1              0     0                           00747  00000 00000  B28  OE(SINPHEE)+RE(COSPHEE)
.        00753 K2              0     0                           00750  00000 00000  B28  OE(COSPHEE)-RE(SINPHEE)
.        00754 SELSRA          ENT   A*W(SRA)                    00751  11030 63004
.        00755 SELSOEC         ENT   A*W(SOEC)                   00752  11030 63005
.        00756 SELRA           ENT   A*W(RA)                     00753  11030 63002
.        00757 SELOEC          ENT   A*W(OEC)                    00754  11030 63003
.        00760 JPRAOE          JP    RAOE                        00755  61000 00164
.        00761 SELAZ           ENT   Q*W(AZIM)*QPOS              00756  10230 63053
.        00762 SELEL           ENT   Q*W(ELEV)*QPOS              00757  10230 63054
.        00763 SELAZWS         ENT   Q*W(SAZIM)*QPOS             00760  10230 63055
.        00764 SELELWS         ENT   Q*W(SELEV)*QPOS             00761  10230 63056
.        00765 SELAZCS         ENT   Q*W(CAZIM)*QPOS             00762  10230 63060
.        00766 SELELCS         ENT   Q*W(CELEV)*QPOS             00763  10230 63061
.        00767 SELRANC         ENT   A*W(TRUERANGE)*ANOT         00764  11530 63063
.        00770 JPAZEL          JP    AER                         00765  61000 00172
.        00771 SELRAN          ENT   A*W(TRUERANGE)*ANOT         00766  11530 63063
.        00772 SETAE           JP    AEOUT                       00767  61000 00402
.        00773 SETAEIN         JP    AEIN                        00770  61000 00474
.        00774 RAOUT           0     0                           00771  00000 00000  B27 IN REV
.        00775 OECOUT          0     0                           00772  00000 00000  B27 IN REV
.        00776 WNEREV          10000       0                     00773  10000 00000  ONE REV B27
.        00777 REVMASK         07777       77777                 00774  07777 77777
.        01000 THSIXTY         3110375523                        00775  31103 75523  OEC        6.2831853B26

.        01001 AZ              0     0                           00776  00000 00000  AZIMUTH IN RADIANS B26
.        01002 EL              0     0                           00777  00000 00000  ELEVATION  RADIANS B26
.        01003 TARRANGE        0     0                           01000  00000 00000  TARGET RANGE  0=INFINITE
.        01004 TEMP            0     0                           01001  00000 00000
.        01005 SINAZ           0     0                           01002  00000 00000
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CAROS	L1 IO	LABEL	TA	STATEMENT	LOC	F JKB Y	NOTES	
.	01006	COSAZ	0	0	01003	C0000 00000		
.	01007	SINEL	0	0	01004	00000 00000		
.	01010	COSEL	0	0	01005	00000 00000		
.	01011	SINORAGON	0	0	01006	00000 00000		
.	01012	COSORAGON	0	0	01007	C0000 00000		
.	01013	FACT1	0	0	01010	C0000 00000	B28	
.	01014	FACT2	0	0	01011	C0000 00000	B28	
.	01015	XSPRIME	0	0	01012	C0000 00000	B27	
.	01016	YSPRIME	0	0	01013	C0000 00000	B27	
.	01017	K11	0	0	01014	00000 00000		
.	01020	K21	0	0	01015	00000 00000		
.	01021	ZSPRIME	0	0	01016	00000 00000		
.	01022	SCALEB26	0	26D	01017	C0000 00032		
.	01023	LHAIMAGE	0	30	01020	00000 00030		
.	01024	LHAOUT	0	0	01021	00000 00000		
.	01025	RAOTOREV	0505746031		01022	05057 46031	OEC	.15915494829
.	01026	QUARTEREV	02000	0	01023	02000 00000		
.	01027	THQUART	06000	0	01024	06000 00000		
.	01030	AZOUTBUF	EQUALS	00133				
.	01031	AZINBUF	EQUALS	00113				
.	01032	ELOUTBUF	EQUALS	00132				
.	01033	ELINBUF	EQUALS	00112				
.	01034	SAVE19BITS	00017	77777	01025	00017 77777		
.	01035	WHICHCLASS	0	0	01026	00000 00000		
.	01036	WHICHAE	0	0	01027	00000 00000		
.	01037	WHICHRA	0	0	01030	C0000 00000		
.	01040	WUTA	FO	0•A	01031	06050 50505		
.	01041		77777	WUTAA	01032	77777 01033		
.	01042	WUTAA	FO	0•RA/OEC OISPLAY FROM CELESTIAL CO	01033	27067 41112		
			RO.(1) AZ/EL COORO.(2)					
					01034	10051 11630		
					01035	25210 63605		
					01036	13272 42205		
					01037	10122 11230		
					01040	31160 62105		
					01041	10242 42711		
					01042	75516 14005		
					01043	06377 41221		
					01044	C5102 42427		
					01045	11755 16240		
.	01043		77777	77777	01046	77777 77777		
.	01044	WUTB	FO	0•A	01047	06050 50505		
.	01045		77777	WUTBB	01050	77777 01051		
.	01046	WUTBB	FO	0•ACTUAL(1) COMMANO(2) UNCORR.AZ/EL	01051	C6103 13206		
			(3) AZ/EL+SCAN(4) CORR					
					01052	21516 14005		
					01053	10242 22206		
					01054	23115 1624C		
					01055	05322 31024		
					01056	27277 50637		
					01057	74122 15163		
					01060	40050 63774		

CAROS	L1	IO	LABEL	TA	STATEMENT	LOC	F JKB Y	NOTES
						01061	12214 23010	
						01062	06235 1644C	
						01063	05102 42727	
.	01047			FD	O*.AZ/EL(5)	01064	75063 77412	
						01065	21516 54005	
.	01050			77777	77777	01066	77777 77777	
.	01051		WUTC	FO	O*A	01067	06050 50505	
.	01052			77777	WUTCC	01070	77777 01071	
.	01053		WUTCC	FO	O*RA/OEC(1) RA/OEC+SCAN(2)	01071	27067 41112	
						01072	10516 14005	
						01073	27067 41112	
						01074	10423 01006	
						01075	23516 24005	
.	01054			77777	77777	01076	77777 77777	
.	01055		INA	FO	1*O	01077	11050 50505	
.	01056			11	WHICHCLASS	01100	00011 01026	
.	01057			0	1	01101	00000 00001	
.	01060			0	2	01102	00000 00002	
.	01061		INB	FO	1*O	01103	11050 50505	
.	01062			11	WHICHAE	01104	00011 01027	
.	01063			0	1	01105	00000 00001	
.	01064			0	5	01106	00000 00005	
.	01065		INC	FO	1*O	01107	11050 50505	
.	01066			11	WHICHRA	01110	00011 01030	
.	01067			0	1	01111	00000 00001	
.	01070			0	2	01112	00000 00002	
.	01071		ASIN	JP	ASIN	01113	61000 01113	
.	01072			STR	A*W(ASIN+270)*APOS	01114	15630 01146	
.	01073			CP	A*	01115	15040 00000	SET ARGUMENT POSITIVE
.	01074			COM	Q*570*YMORE	01116	04300 00071	
.	01075			ENT	Q*570	01117	10000 00071	
.	01076			AOO	Q*2	01120	26000 00002	
.	01077			JP	ASIN+220*AZERO	01121	60400 01141	
.	01100			STR	Q*L(ASIN+90)*QPOS	01122	14210 01124	
.	01101			JP	L(ASIN)	01123	61010 01113	
.	01102			RSH	AQ*O*ANOT	01124	03500 0000C	CHECK FOR ARGUMENT GREATER OR 2
.	01103			STR	Q*W(ASIN+280)*QPOS	01125	14230 01147	
.	01104			JP	L(ASIN)	01126	61010 01113	ERROR RETURN
.	01105			MUL	W(ASIN+280)	01127	22030 01147	
.	01106			RSH	AQ*280	01130	03000 00034	
.	01107			SUB	Q*O*QNOT	01131	27500 00000	
.	01110			JP	$+16	01132	61000 01150	
.	01111			ENT	Y-Q*W(ASIN+260)	01133	31030 01145	
.	01112			RJP	SQRT	01134	65000 01374	COMPUTE SQRT(1-ARG SQUARED)
.	01113			JP	L(ASIN)	01135	61010 01113	
.	01114			ENT	Q*A	01136	10070 00000	ARCSINEX ARCTAN(X/SQRT(1-XSQUAREO))
.	01115			ENT	A*W(ASIN+280)	01137	11030 01147	
.	01116			RJP	ATAN	01140	65000 01152	COMPUTE ARCSINE (-X)
.	01117			ENT	Q*W(ASIN+270)*QPOS	01141	10230 01146	
.	01120			CP	A*	01142	15040 00000	
.	01121			ENT	B7*L(ASIN)	01143	12710 01113	

```
CARDS   L1 ID LABEL      TA STATEMENT                    LOC    F JK8 Y      NOTES
  .     01122              JP   1+87                     01144  61007 00001  EXIT
  .     01123              20000      00000              01145  20000 00000  1 AT 28
  .     01124              0    0                        01146  00000 00000  TEMPORARY
  .     01125              0    0                        01147  00000 00000  TEMPORARY
  .     01126              ENT  A*W(ASIN+26D)            01150  11030 01145
  .     01127              JP   $-13                     01151  61000 01136
  .     01130 ATAN         JP   ATAN                     01152  61000 01152
  .     01131              STR  A*W(ATAN+620)*APOS       01153  15630 01250
  .     01132              CP   A*                       01154  15040 00000  SET POSITIVE
  .     01133              STR  Q*W(ATAN+63D)*QPOS       01155  14230 01251
  .     01134              CP   Q*                       01156  14000 00000  SET POSITIVE
  .     01135              STR  A-Q*W(ATAN+64D)          01157  33030 01252  FLAG BEARS SIGN ($Y$-$X$)
  .     01136              ENT  Y+Q*A                    01160  30070 00000  RESTORE A
  .     01137              COM  Q*A*YLESS                01161  04270 00000  MIN ($Y$,$X$) TO A
  .     01140              LSH  AQ*30D                   01162  07000 00036  INTERCHANGE A,C
  .     01141              STR  Q*W(ATAN+650)            01163  14030 01253  DIVISOR Q MAX ($Y$,$Y$)
  .     01142              RSH  AQ*2                     01164  03000 00002  SCALE DIVIDENO AT 28
  .     01143              DIV  W(ATAN+650)*NOOF         01165  23230 01253  DIVISOR AT 0
  .     01144              JP   L(ATAN)                  01166  61010 01152
  .     01145              STR  Q*W(ATAN+650)            01167  14030 01253  QUOTIENT AT 28
  .     01146              SUB  A*A                      01170  21070 00000  CLEAR ACCUMULATOR
  .     01147              LSH  AQ*6*QPOS                01171  07200 00006  ROUND TO NEAREST 16TH
  .     01150              ADD  A*1                      01172  20000 00001
  .     01151              ENT  87*A                     01173  12770 00000  LOAD INDEX REGISTER FOR TABLE
                                                                             LOOKUP
  .     01152              STR  Q*W(ATAN+66D)            01174  14030 01254  Y-YR AT 34
  .     01153              ENT  Q*A                      01175  10070 00000  YR AT 4
  .     01154              MUL  W(ATAN+650)              01176  22030 01253  Y YR AT 4+28 32
  .     01155              ADD  A*4                      01177  20000 00004  4 1 AT 2 + 30 32
  .     01156              RSH  AQ*4                     01200  03000 00004  SCALE AT 1 + Y YR AT 28 IN Q
  .     01157              STR  Q*W(ATAN+65D)            01201  14030 01253
  .     01160              ENT  A*W(ATAN+66D)            01202  11030 01254  Y YR AT 34
  .     01161              RSH  AQ*8D                    01203  03000 0001C  SCALE DIVIDENO AT 34-8+30
  .     01162              DIV  W(ATAN+650)              01204  23030 01253  (Y-Y)/(1+Y YR)
  .     01163              STR  Q*W(ATAN+65D)            01205  14030 01253  2 AT 28
  .     01164              MUL  W(ATAN+65D)              01206  22030 01253  Z 2 AT 56
  .     01165              DIV  W(ATAN+430)              01207  23030 01225  -3 AT 26,Q AT 56-26 30
  .     01166              MUL  W(ATAN+650)              01210  22030 01253  -Z 3/3 AT 28
  .     01167              ADD  A*W(ATAN+65D)            01211  20030 01253  Z - Z 3/3 AT 28
  .     01170              ADD  A*W(ATAN+450+87)         01212  20037 01227  ADD TABLE ENTRY
  .     01171              ENT  Q*W(ATAN+64D)*QNEG       01213  10330 01252  CHECK SIGN ($Y$,$X$)
  .     01172              SUB  A*W(ATAN+44D)*SKIP       01214  21130 01226  COMPLEMENT ANGLE
  .     01173              CP   A*                       01215  15040 00000  SET NEGATIVE
  .     01174              RSH  A*1                      01216  02000 00001  RESULT AT 27
  .     01175              ENT  Q*W(ATAN+63D)*QPOS       01217  10230 01251  SUPPLEMENT IF X NEGATIVE
  .     01176              ADD  A*W(ATAN+44D)*SKIP       01220  20130 01226  PI/2 AT 28 PI AT 27
  .     01177              CP   A*                       01221  15040 00000  SET POSITIVE
  .     01200              ENT  Q*W(ATAN+62D)*QPOS       01222  10230 01250  ACCORD PROPER SIGN
  .     01201              CP   A*                       01223  15040 00000
  .     01202              JP   L(ATAN)                  01224  61010 01152  EXIT
  .     01203              63774      42363              01225  63774 42363  3.0016901 AT 26
  .     01204              31103      75524              01226  31103 75524  PI/2 AT 28 PI AT 27
  .     01205              0    0                        01227  00000 00000  ARCTAN(00/16) AT 28
```

CARDS	L1	IO	LABEL	TA	STATEMENT		LOC	F	JKB	Y	NOTES
.	01206				00777	25336	01230	00777		25336	1
.	01207				01772	55652	01231	01772		55652	2
.	01210				02756	27552	01232	02756		27552	3
.	01211				03726	67277	01233	03726		67277	4
.	01212				04661	16716	01234	04661		16716	5
.	01213				05573	03120	01235	05573		03120	6
.	01214				06462	35661	01236	06462		35661	7
.	01215				07326	14701	01237	07326		14701	8
.	01216				10145	37512	01240	10145		37512	9
.	01217				10740	02726	01241	10740		02726	10
.	01220				11505	74016	01242	11505		74016	11
.	01221				12227	43722	01243	12227		43722	12
.	01222				12725	42304	01244	12725		42304	13
.	01223				13400	51742	01245	13400		51742	14
.	01224				14031	64134	01246	14031		64134	15
.	01225				14441	76652	01247	14441		76652	16
.	01226				0	0	01250	00000		00000	TEMPORARIES
.	01227				0	0	01251	00000		00000	
.	01230				0	0	01252	00000		00000	
.	01231				0	0	01253	00000		00000	
.	01232				0	0	01254	00000		00000	
.	01233		CUS		JP	COS	01255	61000		01255	ARBITRARY
.	01234				ENT	B7*L(COS)	01256	12710		01255	STORE EXIT
.	01235				STR	B7*L(SIN)	01257	16710		01266	
.	01236				ENT	B7*1	01260	12700		00001	FLAG
.	01237				STR	B7*L(SIN+42D)	01261	16710		01340	
.	01240				JP	COS+7*APOS	01262	60600		01264	
.	01241				CP	A*	01263	15040		00000	
.	01242				JP	SIN+2*ANOT	01264	60500		01270	
.	01243				ENT	A*W(SIN+60D)	01265	11030		01362	COS (0) 1
.	01244		SIN		JP	SIN	01266	61000		01266	ARBITRARY
.	01245				STR	B0*L(SIN+42D)	01267	16010		01340	FLAG
.	01246				STR	A*W(SIN+68D)*APOS	01270	15630		01372	
.	01247				CP	A*	01271	15040		00000	SET POSITIVE
.	01250				RPT	29D	01272	70000		00035	
.	01251				LSH	A*1*ANEG	01273	06700		00001	SHIFT UNTIL BIT 29 1
.	U1252				JP	L(SIN)	01274	61010		01266	SIN(X) 0
.	01253				LSH	A*29D	01275	06000		00035	SHIFT RIGHT 1
.	01254				SUB	Q*B7*QPOS	01276	27607		00000	QNEG IMPLIES X EXCEEDS PI/2
.	01255				JP	SIN+34D	01277	61000		01330	
.	01256				COM	Q*30D*YMORE	01300	04300		00036	PREVENT ILLEGITIMATE SHIFT
.	01257				ENT	Q*30D	01301	10000		00036	MAX SHIFT 30
.	01260				STR	Q*L(SIN+13D)	01302	14010		01303	SOTRE SHIFT COUNT
.	01261				RSH	A*0	01303	02000		00000	SCALE ARGUMENT AT 28
.	01262				COM	A*W(SIN+59D)*YMORE	01304	04730		01361	COMPARE WITH PI/2
.	U1263				JP	SIN+37D	01305	61000		01333	REDUCE TO 1ST QUADRANT
.	U1264				BSK	B0*L(SIN+42D)	01306	71010		01340	SKIP IF SINE
.	01265				SUB	A*W(SIN+59D)*SKIP	01307	21130		01361	PI/2-X TO A
.	U1266				ENT	Q*W(SIN+68D)*QPOS	01310	10230		01372	CHECK SIGN
.	01267				CP	A*	01311	15040		00000	A BEARS PROPER SIGN
.	01270				STR	A*W(SIN+68D)	01312	15030		01372	STORE SIGNED ARGUMENT
.	01271				ENT	Q*A	01313	10070		00000	SCALED AT 28
.	01272				MUL	W(SIN+68D)	01314	22030		01372	X 2 AT 28+28 56

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CAROS    L1 ID LABEL      TA STATEMENT                          LOC    F JKB Y      NOTES

.        01273            RSH  AQ*29D                         01315  03000 00035  SQUARED AT 27
.        01274            STR  Q*W(SIN+69D)                    01316  14030 01373  STORE X 2
.        01275            ENT  Q*W(SIN+64D)                    01317  10030 01366  C9
.        01276            ENT  B7*3                            01320  12700 00003  LOOP 4 TIMES
.        01277            MUL  W(SIN+69D)                      01321  22030 01373  SUM POLYNOMIAL
.        01300            ENT  Q*A                             01322  10070 00000
.        01301            ADD  Q*W(SIN+60D+B7)                 01323  26037 01362
.        01302            BJP  B7*SIN+27D                      01324  72700 01321
.        01303            MUL  W(SIN+68D)                      01325  22030 01372
.        01304            LSH  AQ*2                            01326  07000 00002  SCALE AT 28
.        01305            JP   L(SIN)                          01327  61010 01266  RETURN
.        01306            COM  Q*X77741*YLESS                  01330  04240 77741  CHECK FOR LEGIT SHIFT
.        01307            ENT  Q*X77741                        01331  10040 77741  -30
.        01310            STR  Q*CPL(SIN+13D)                  01332  14050 01303
.        01311            RSH  AQ*2                            01333  03000 00002
.        01312            DIV  W(SIN+59D)                      01334  23030 01361  FORM X/(PI/2)
.        01313            ENT  A*0                             01335  11000 00000  CLEAR A
.        01314            LSH  AQ*L(SIN+13D)                   01336  07010 01303
.        01315            LSH  AQ*2                            01337  07000 00002  INTEGER TO A, FRACTION IN Q
.        01316            ADD  A*0                             01340  20000 00000  0 FOR SIN , 1 FOR COS
.        01317            RSH  AQ*2                            01341  03000 00002
.        01320            ENT  LP*W(SIN+67D)*ANOT              01342  40530 01371
.        01321            ENT  LP*W(SIN+60D)*ANOT              01343  40530 01362
.        01322            JP   SIN+51D                         01344  61000 01351
.        01323            SUB  LP*W(SIN+66D)                   01345  42030 01370
.        01324            ENT  Q*W(SIN+68D)*QPOS               01346  10230 01372  ACCORD SIGN
.        01325            CP   A*                              01347  15040 00000
.        01326            JP   L(SIN)                          01350  61010 01266
.        01327            ENT  LP*W(SIN+65D)*ODD               01351  40330 01367
.        01330            JP   SIN+56D                         01352  61000 01356
.        01331            14200     0                          01353  14200 00000  CP,Q,QPOS
.        01332            SUB  Q*W(SIN+66D)*SKIP               01354  27130 01370
.        01333            ADD  Q*W(SIN+66D)                    01355  26030 01370
.        01334            MUL  W(SIN+59D)                      01356  22030 01361
.        01335            LSH  AQ*2                            01357  07000 00002  SCALE AT 28
.        01336            JP   SIN+18D                         01360  61000 01310  RETURN
.        01337            31103     75524                      01361  31103 75524  PI/2 AT 28
.        01340            20000     00000                      01362  20000 00000  C1 1$0 AT 28
.        01341            52525     25600                      01363  52525 25600  C3-0$1666  665669E00831
.        01342            10420     71732                      01364  10420 71732  C5 0.833302518E-2834
.        01343            76301     15701                      01365  76301 15701  C7-.1980741431E-3837
.        01344            00127     23405                      01366  00127 23405  C9 0.2601886909E-5840
.        01345            60000     00000                      01367  60000 00000
.        01346            40000     00000                      01370  40000 00000
.        01347            17777     77777                      01371  17777 77777
.        01350            0    0                               01372  00000 00000  TEMPORARY
.        01351            0    0                               01373  00000 00000  TEMPORARY
.        01352 SQRT       JP   SQRT                           01374  61000 01374  ARBITRARY
.        01353            CL   Q*                              01375  10000 00000  CLEAR Q
.        01354            RPT  14D                             01376  70000 00016  NORMALIZE
.        01355            RSH  AQ*2*AZERO                      01377  03400 00002  SHIFT UNTIL A 0
.        01356            JP   L(SQRT)*ANOT                    01400  60510 01374  ERROR,BIT 28 OR 29 1
.        01357            LSH  AQ*28D                          01401  07000 00034  NORMALIZE IN A
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SPURT OUTPUT NO. 210
RADEC STYLOS*10/22/64

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CARDS    L1 IO LABEL      TA STATEMENT                          LOC    F JKB Y      NOTES

   .     01360              STR   A*W(SQRT+340)*ANOT            01402  15530 01436  STORE NORMALIZED RADICAND
   .     01361              JP    SQRT+290                      01403  61000 01431  RADICAND 0
   .     01362              RSH   A*3                           01404  02000 00003  DIVIDE BY 8 FOR LINEAR APPROX
   .     01363              COM   A*W(SQRT+310)*YMORE           01405  04730 01433  SKIP IF BIT 24 0
   .     01364              ADD   A*W(SQRT+330)*SKIP            01406  20130 01435  ADD 7/8
   .     01365              15140      00000                    01407  15140 0000C  CP,A,SKIP
   .     01366              ADD   A*W(SQRT+340)*SKIP            01410  20130 01436  ARG/8+7/8+ARG
   .     01367              ADD   A*W(SQRT+320)*SKIP            01411  20130 01434  ADD 9/32
   .     01370              RSH   A*1*SKIP                      01412  02100 00001  DIVIDE BY 2
   .     01371              ADD   A*W(SQRT+340)                 01413  20030 01436  ARG/8+9/32+ARG
   .     01372              STR   A*W(SQRT+350)                 01414  15030 01437  LINEAR APPROX COMPLETE
   .     01373              ENT   A*W(SQRT+340)                 01415  11030 01436  ENTER RADICAND (SCALED AT 28)
   .     01374              RSH   AQ*2                          01416  03000 00002  SCALE AT 26
   .     01375              DIV   W(SQRT+350)                   01417  23030 01437  DIVIDE (SCALED AT 28)
   .     01376              ADD   Q*W(SQRT+350)                 01420  26030 01437
   .     01377              RSH   Q*1                           01421  01000 00001
   .     01400              STR   Q*W(SQRT+350)                 01422  14030 01437
   .     01401              ENT   A*W(SQRT+340)                 01423  11030 01436  ENTER RADICAND
   .     01402              RSH   AQ*2                          01424  03000 00002  SCALE 2(ARG) AT 26
   .     01403              DIV   W(SQRT+350)                   01425  23030 01437  DIVIDE,RESULT IN Q
   .     01404              ENT   Y+Q*W(SQRT+350)               01426  30030 01437  2IRESULT TO A
   .     01405              RSH   AQ*1+B7*QPOS                  01427  03207 00001
   .     01406              ADD   A*1                           01430  20000 00001  ROUND
   .     01407              ENT   B7*LISQRT)                    01431  12710 01374  EXIT ADDRESS TO B7
   .     01410              JP    1+B7                          01432  61007 00001  RETURN
   .     01411              01000      00000                    01433  01000 0000C
   .     01412              04400      00000                    01434  04400 0000C  9/32 AT 28
   .     01413              16000      00000                    01435  16000 00000  7/8 AT 28
   .     01414              0     0                            01436  00000 00000  TEMPORARY
   .     01415              0     0                            01437  00000 0000C  TEMPORARYATAN
   .     01416              RESERVE    1                       01440  00000 0000C

END OF LISTING
```

ACQAZIM	63071	ACQELEV	63075	ACQUI	63427
ACTUALTIME	63142	ADSCN	63416	AEDUT	00402
AEIN	00474	AEIN1	00422	AEIN2	00447
AER	00172	AESCN	63417	ASIN	01113
ASTRODEC	63106	ASTRORA	63105	ATAN	01152
AUCONVER	63332	AUPEREQUAT	63341	AZ	00776
AZOUTBUF	00133	AZEL	00111	AZELCS	00123
AZELWS	00116	AZIM	63053	AZIMDUT	64000
AZIMDVER	63325	AZIMADO	63442	AZIMIN	75000
AZINBUF	00113	BLASTOFF	63146	COCON	63414
COMPSITED	00525	CONRASITE	00733	CONRA	00615
CONVERTIME	63135	CONVRADEC	00532	CORCT	63420
COS	01255	COSDRIENT	63065	COSAZ	01003
COSAZEL	63070	COSDRAGON	01007	COSEL	01005
COSPHEE	00745	CAZIM	63060	CELBODY	63113
CELCOMPGM	63424	CELESTIAL	00067	CELEV	63061
CELTIME	63133	CHCOR	63422	CHPAR	63431
CLOCKINTER	00027	CRANGE	63057	DOPPOUT	66000
DOPPADD	63444	D2483	00656	D36DB3	00660
D60B1	00665	DATANALYZE	63425	DAY	63150
DEC	63003	DECOUT	00772	DECOUTA	00711
DECDOT	63010	DECIMAGE	00725	DECNEG	00663
DEGRAD	00741	DELTATEE	63316	DETRAANDD	00214
DIFFSEC	00727	DPLAY	00707	DSECONDS	63141
DUM1	00657	DUMSECTTG	63154	DYDMP	63421
EL	00777	ELOUTBUF	00132	ELEV	63054
ELEVOUT	65000	ELEVADD	63443	ELEVIN	76000
ELINBUF	00112	ENTAZ	00173	ENTDEC	00167
ENTEL	00202	ENTRA	00165	ENTRANGE	00211
EQUATOR	63323	ESTSHIFTED	63143	EXPNAME	63350
FOURSEC	00730	FACT1	01010	FACT2	01011
FIRSTELEV	63104	FIRSTHRU	63153	FLATTENING	63337
FRACTION	00723	FRAMESIZE	63101	FREQUENCY	63317
GEOCENLAT	63322	GEODETLAT	63321	GMTMODU24	63145
GMTSHIFTED	63144	HOURMINUTE	63137	HOURREG	63151
HALFSECREV	00661	HEIGHT	63326	HHH	00664
ID1DRADIO	66777	IO11RADIO	67776	ID12RADID	67777
ID13RADIO	70775	IO14RADIO	70776	ID15RADID	71776
ID16RADIO	71777	IO17RADIO	72776	ID1BRADID	72777
ID19RADIO	73776	IO1CELCOR	63000	ID1ENTPNT	63410
ID1RADCOR	63050	IO1RADIO	6344D	ID1RECRD	63210
ID1SYSENT	77576	IO1SYSNAM	77676	ID1SYSPAR	63310
ID1TIME	63130	IO2ORADID	73777	IO21RADID	74776
ID22RADIO	74777	ID23RADID	75776	ID24RADIO	75777
ID25RADIO	76775	IO26RADIO	76776	ID2CELCOR	63001
IO2ENTPNT	63411	IO2RADCOR	63051	ID2RADID	63441
ID2RECRD	63211	IO2SYSENT	77577	ID2SYSNAM	77677
ID2SYSPAR	63311	IO2TIME	63131	ID3RADID	63776
ID4RADIO	63777	IO5RADIO	64776	ID6RADIO	64777
ID7RADID	65776	IO8RADIO	65777	IO9RADIO	66776
INA	01077	INAZIMADD	63446	INB	01103

RAOEC STYLOS*10/22/64

LABEL	LOC	LABEL	LOC	LABEL	LOC
INC	01107	INELEVAOO	63447	INIT	00002
INITEND	00135	INTER	63413	INTERAZIM	72000
INTERCOM	63426	INTEROOPP	74000	INTERELEV	73000
INTERG	00722	INTERRANGE	76777	JPAZEL	00765
JPRADE	00755	K1	00747	K11	01014
K2	00750	K21	01015	KMPERNM	63342
KYBRDLEVEL	63110	LONGITUOE	63320	LHAOUT	01021
LHAIMAGE	01020	LSPERAU	63336	MAINSWIT	00163
MAINSWITCH	63334	MCPFILLER	71000	MCPGM	63412
MINREG	63152	MMM	00666	NOGO	00703
NMPERAU	63340	POLE	63324	PHEE	00742
PLANP	63434	PRLOG	63423	QUARTEREV	01023
RA	63002	RAOUT	00771	RAOUTA	00710
RAOOT	63007	RADDUT	00140	RAOARMOOE	63312
RAOE	00164	RADEC	00000	RADEC1	00101
RAOECINT	00670	RADECWSC	00074	RAOIOMETER	63102
RAOIN	00144	RAOIUS	63006	RAOIUSOOT	63011
RAOTOREV	01022	RAH	00713	RAIMAGE	00724
RANGE	63052	RANGEOUT	70777	RANGEAOO	63445
RANGEDDT	63062	RDMIR	63430	ROXXX	63433
RECOROSIZE	63112	RECAZIM	67000	RECELEV	70000
RECFILE	63212	RECRO	63415	REGULAR	00150
REVMASK	00774	REVTOOEG	00712	RILX	00740
SAVE19BITS	01025	SAVEA	00734	SAVEB6	00736
SAVEQ	00735	SAZIM	63055	SCALEB24	00746
SCALEB26	01017	SCELTIME	63134	SOEC	63005
SECONOS	63140	SELAZ	00756	SELAZCS	00762
SELAZWS	00760	SELDEC	00754	SELEL	00757
SELELCS	00763	SELELWS	00761	SELEV	63056
SELRA	00753	SELRAN	00766	SELRANC	00764
SELSDEC	00752	SELSRA	00751	SETAE	00767
SETAEIN	00770	SETBIGKO	00234	SEVSECREV	00662
SIOERTIME	63012	SIN	01266	SINORIENT	63064
SINAZ	01002	SINAZEL	63066	SINORAGON	01006
SINEL	01004	SINPHEE	00744	SITEDRAGON	00737
SKIP	63331	SQRT	01374	SRA	63004
SRAOTIME	63136	SSS	00667	SYSENTRIES	77600
SYSNAMES	77700	SYSTAT1	63313	SYSTAT2	63314
SYSTATD	63315	TARRANGE	01000	TEMP	01001
THQUART	01024	THREESEC	00731	THSIXTY	00775
TIMECORR	63107	TIMEINTER	00726	TIMEMOOE	63103
TIMEP	63435	TRUERANGE	63063	TRUETIME	63132
TSF	00743	TTYSTATUS	63111	VELOFLIGHT	63335
VIZOEC1	63014	VIZDEC2	63016	VIZRA1	63013
VIZRA2	63015	WONSEC	00732	WORKING	00161
WFORD	63432	WFADO	63450	WFFREQ	63333
WHICHAE	01027	WHICHCLASS	01026	WHICHRA	01030
WNEREV	00773	WUTA	01031	WUTAA	01033
WUTB	01047	WUTBB	01051	WUTC	01067
WUTCC	01071	XSPRIME	01012	YEARMONTH	63147
YRTRAN	63327	YSPRIME	01013	ZRTRAN	63330

..... SPURT OUTPUT NO. 212 .....

RAOEC STYLOS*10/22/64

LABEL	LOC	LABEL	LOC	LABEL	LOC
RAOEC	00000	INIT	00002	CLOCKINTER	00027
CELESTIAL	00067	RAOECWSC	00074	RAOEC1	00101
AZEL	00111	ELINBUF	00112	AZINBUF	00113
AZELWS	00116	AZELCS	00123	ELOUTBUF	00132
AZOUTBUF	00133	INITEND	00135	RAOOUT	00140
RAOIN	00144	REGULAR	00150	WORKING	00161
MAINSWIT	00163	RAOE	00164	ENTRA	00165
ENTOEC	00167	AER	00172	ENTAZ	00173
ENTEL	00202	ENTRANGE	00211	OETRAANOD	00214
SETBIGKO	00234	AEOUT	00402	AEIN1	00422
AEIN2	00447	AEIN	00474	COMPSITEO	00525
CONVRAOEC	00532	CONRA	00615	024B3	00656
OUM1	00657	036CB3	00660	HALFSECREV	00661
SEVSECREV	00662	OECNEG	00663	HHH	00664
060B1	00665	MMM	00666	SSS	00667
RAOECINT	00670	NOGO	00703	OPLAY	00707
RAOUTA	00710	OECOUTA	00711	REVTOOEG	00712
RAH	00713	INTERG	00722	FRACTION	00723
RAIMAGE	00724	OECIMAGE	00725	TIMEINTER	00726
OIFFSEC	00727	FOURSEC	00730	THREESEC	00731
WONSEC	00732	COMRASITE	00733	SAVEA	00734
SAVEQ	00735	SAVEB6	00736	SITEORAGON	00737
RILX	00740	OEGRAO	00741	PHEE	00742
TSF	00743	SINPHEE	00744	COSPHEE	00745
SCALEB24	00746	K1	00747	K2	00750
SELSRA	00751	SELSOEC	00752	SELRA	00753
SELOEC	00754	JPRAOE	00755	SELAZ	00756
SELEL	00757	SELAZWS	00760	SELELWS	00761
SELAZCS	00762	SELELCS	00763	SELRANC	00764
JPAZEL	00765	SELRAN	00766	SETAE	00767
SETAEIN	00770	RAOUT	00771	OECOUT	00772
WNEREV	00773	REVMASK	00774	THSIXTY	00775
AZ	00776	EL	00777	TARRANGE	01000
TEMP	01001	SINAZ	01002	COSAZ	01003
SINEL	01004	COSEL	01005	SINORAGON	01006
COSORAGON	01007	FACT1	01010	FACT2	01011
XSPRIME	01012	YSPRIME	01013	K11	01014
K21	01015	ZSPRIME	01016	SCALEB26	01017
LHAIMAGE	01020	LHAOUT	01021	RAOTOREV	01022
QUARTEREV	01023	THQUART	01024	SAVE19BITS	01025
WHICHCLASS	01026	WHICHAE	01027	WHICHRA	01030
WUTA	01031	WUTAA	01033	WUTB	01047
WUTBB	01051	WUTC	01067	WUTCC	01071
INA	01077	INB	01103	INC	01107
ASIN	01113	ATAN	01152	COS	01255
SIN	01266	SQRT	01374	IO1CELCOR	63000
IO2CELCOR	63001	RA	63002	OEC	63003
SRA	63004	SOEC	63005	RAOIUS	63006
RAOOT	63007	OECOOT	63010	RAOIUSOOT	63011
SIOERTIME	63012	VIZRA1	63013	VIZOEC1	63014
VIZRA2	63015	VIZOEC2	63016	IO1RAOCOR	63050

RADEC STYLOS*1D/22/64

LABEL	LOC	LABEL	LOC	LABEL	LOC
IO2RADCDR	63051	RANGE	63052	AZIM	63053
ELEV	63054	SAZIM	63055	SELEV	63056
CRANGE	63057	CAZIM	63060	CELEV	63061
RANGEDDT	63062	TRUERANGE	63063	SINDRIENT	63064
COSORIENT	63065	SINAZEL	63066	COSAZEL	63070
ACQAZIM	63071	ACQELEV	63075	FRAMESIZE	63101
RADIDMETER	63102	TIMEMODE	63103	FIRSTELEV	63104
ASTRDRA	63105	ASTRODEC	63106	TIMECDRR	63107
KYBRDLEVEL	63110	TTYSTATUS	63111	RECDRDSIZE	63112
CELBDDY	63113	ID1TIME	63130	ID2TIME	63131
TRUETIME	63132	CELTIME	63133	SCELTIME	63134
CONVERTIME	63135	SRADTIME	63136	HDURMINUTE	63137
SECONDS	63140	DSECONDS	63141	ACTUALTIME	63142
ESTSHIFTED	63143	GMTSHIFTED	63144	GMTMDDU24	63145
BLASTOFF	63146	YEARMONTH	63147	DAY	63150
HDURREG	63151	MINREG	63152	FIRSTHRU	63153
DUMSECTTG	63154	ID1RECRD	63210	ID2RECRD	63211
RECFILE	63212	ID1SYSPAR	63310	ID2SYSPAR	63311
RADARMODE	63312	SYSTAT1	63313	SYSTAT2	63314
SYSTATD	63315	DELTATEE	63316	FREQUENCY	63317
LONGITUDE	63320	GEODETLAT	63321	GEOCENLAT	63322
EQUATOR	63323	POLE	63324	AZIMOVER	63325
HEIGHT	63326	YRTRAN	63327	ZRTRAN	63330
SKIP	63331	AUCONVER	63332	WFFREQ	63333
MAINSWITCH	63334	VELOFLIGHT	63335	LSPERAU	63336
FLATTENING	63337	NMPERAU	63340	AUPEREQUAT	63341
KMPERNM	63342	EXPNAME	63350	ID1ENTPNT	63410
ID2ENTPNT	63411	MCPGM	63412	INTER	63413
COCON	63414	RECRO	63415	ADSCN	63416
AESCN	63417	CORCT	63420	DYOMP	63421
CHCOR	63422	PRLOG	63423	CELCOMPGM	63424
DATANALYZE	63425	INTERCOM	63426	ACQUI	63427
RDMTR	63430	CHPAR	63431	WFORD	63432
RDXXX	63433	PLANP	63434	TIMEP	63435
ID1RADID	63440	ID2RADIO	63441	AZIMADD	63442
ELEVADD	63443	DDPPADD	63444	RANGEADD	63445
INAZIMADD	63446	INELEVADD	63447	WFADD	63450
ID3RADIO	63776	ID4RADIO	63777	AZIMOUT	64000
ID5RADIO	64776	IO6RADIO	64777	ELEVOUT	65000
ID7RADID	65776	IO8RADIO	65777	DDPPOUT	66000
ID9RADID	66776	IO1ORADID	66777	RECAZIM	67000
ID11RADID	67776	IO12RADID	67777	RECELEV	70000
IO13RADIO	70775	IO14RADIO	70776	RANGEOUT	70777
MCPFILLER	71000	IO15RADID	71776	ID16RADIO	71777
INTERAZIM	72000	IO17RADIO	72776	ID18RADIO	72777
INTERELEV	73000	ID19RADID	73776	ID2ORADIO	73777
INTERDDPP	74000	ID21RADID	74776	ID22RADIO	74777
AZIMIN	75000	ID23RADID	75776	ID24RADID	75777
ELEVIN	76000	ID25RADID	76775	ID26RADID	76776
INTERRANGE	76777	IO1SYSENT	77576	ID2SYSENT	77577
SYSENTRIES	77600	IO1SYSNAM	77676	ID2SYSNAM	77677

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